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ABSTRACT

The monograph describes Project INTERFACE, a 2-year collaborative effort among the Board of Cooperative Educational Services (BOCES) of Nassau County (New York), Long Island University, and three local school districts. The project identified the "most effective" implementation strategies for integrating microcomputer instruction into ongoing educational services for the handicapped and then analyzed descriptive documentation of "most effective practices" as they existed in BOCES and local school districts. Analysis of rating scales completed by 25 experts in microcomputer education and special education found that more than 70% of the experts identified the following issues as important for effective microcomputer implementation: a formal needs assessment coupled with long- and short-range goals and a written philosophy/policy statement; specific budgetary allocations with incremental increases; systematic evaluation of all aspects of the microcomputer program; a districtwide coordinator position for microcomputer/special education; definite maintenance contracts and policies; consistent information dissemination; a districtwide committee for the review of hardware; separate computers used for instructional and administrative functions; a committee to review and select software; computer literacy incentives for teachers; inservice training. (DB)

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"Project INTERFACE: Identification of Effective Implementation Strategies for Integrating Microcomputer Instruction Into Ongoing Educational Services for the Handicapped."

Estelle Shaw
Philip Archer
Carol Weissman
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Final Report 1984-86

Grant #G008430074

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ABSTRACT

Project INTERFACE was a two-year collaborative effort between the Board of Cooperative Educational Services of Nassau County, Long Island University (C.W. Post Campus), and three local school districts. The project was funded by the Office of Special Education and Rehabilitative Services of the U.S. Department of Education.

The study identified the "most effective" implementation strategies for integrating microcomputer instruction into ongoing educational services for the handicapped. A needs assessment analyzed important descriptive data and documentation of "most effective practices," as they existed in BOCES and local school districts.

Technical assistance was provided at a demonstration site to enhance its microcomputer implementation effort. Approximately one-third of the implementation goals were targeted for the demonstration site within one school year. Progress within each of the selected goal areas was realized within the school year. More than half of the targeted implementation goals were fully completed within the school year. Goals in the administrative and classroom management areas were more fully realized than were goals pertaining to hardware, software, instruction, and staff development issues. These latter issues required additional budgetary allocations, and development of committees, committee meetings, and a lengthy decision-making process.

Project INTERFACE field-research results were integrated into microcomputer special education courses offered at the C.W. Post Campus of Long Island University. Students rated themselves as significantly more competent in microcomputer practices after completion of the courses as compared to their competence at the start of the course. No differences were evidenced in attitude ratings of the students after completion of the courses.

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INTRODUCTION AND RELATED LITERATURE

Two sets of developments have been occurring in the past several years, both a consequence of the nationwide implementation of PL 94-142. These developments are: 1) the growing numbers of students receiving special education services and 2) the growing body of research concerning the use of microcomputers in the education of children with handicapping conditions. Additionally, several factors have led to the implementation of microcomputers in special education settings: the availability of new technology at reasonable cost, the increasing amount of software, and possible adaptations for certain types of handicapping conditions.

Information gathered on the effective utilization of microcomputers in schools needs to be transferred to school practitioners involved in the daily use of microcomputers within their special education and mainstreamed programs. A 1982 article in Education Week summarizes the current situation. The microcomputer revolution is significantly outpacing both the number of teachers trained to use (microcomputers) and the ability of schools of education to incorporate the technology in terms of faculty expertise, coherent programs and the basic research upon which academic disciplines are traditionally based (Kurz & Toch, 1982).

Many administrators across the country are grappling with the challenge of new technology. Today administrators are faced with a variety of problems centered around computer technology. They are concerned with (a) teaching teachers and administrators about computers, and (b) taking the necessary steps for integrating computers into original school programs.

Administrators need to know about computer capabilities, hardware and software, computer terminology, how to implement computers into the curriculum, and funding issues. They must retrain staffs, school boards, and somehow get the financial resources to make the technology available (Oliver, 1984). Indeed, administrators have the primary responsibility for implementing the changes that lead to the successful utilization of microcomputers.

Moreover, as the literature indicates, the usefulness and effectiveness of research informing educational practice is in jeopardy. Baker argues that the audience for educational research should not be other researchers but educational practitioners, and calls for work at *the juncture between research and practice* (Baker, 1984).

Although the research indicates that microcomputer instruction does contribute to learning outcomes, very little is known regarding the optimal conditions for implementing microcomputer technology into an actual school system. Furthermore, in special education, practitioners often fail to take into account the growing body of research on the use of microcomputers in special education programs and for special education students in mainstreamed settings. Additionally, when practitioners do discover what is appropriate for special education students, they are unable to locate materials to assist them in the "best practices" for the implementation of these programs.

"Project INTERFACE" (Identification of Effective Implementation Strategies for Integrating Microcomputer Instruction Into Ongoing Education Services for the Handicapped), a two-year study funded by the U.S. Department of Education, Office of Special Education and Rehabilitative Services, has as its dual purpose: 1) to determine the most effective implementation

strategies for integrating micro
services for the handicapped and
research effort on the training
tive trainees enrolled in specia
courses. Three major collaborat
study. They were the Board of C
Nassau County, Long Island Unive
local school districts.

Those objectives met by the
effort are enumerated below:

Objective I: To determine those
quired for effective integration
educational services for the han

Objective II: To develop and ma
institute of higher education (L
and the intermediate educational
integrate their research and tra

Objective III: To develop and m
will incorporate those contextua
fulfilling Objective I.

Objective IV: To determine the
effort on the performance of tea
education.

Objective V: To develop and imp
programs (Nassau BOCES and Long
disseminate information on the p
results.

computer usage into ongoing educational
2) to determine the impact of a field
and performance of teaching and administra-
l education microcomputer college level
ors were responsible for this two-year
ooperative Educational Services (BOCES) of
rsity, C.W. Post Campus and collaborating

Project INTERFACE collaborative research

contextual and behavioral variables re-
of microcomputer technology into ongoing
dicapped.
intain mechanisms for the participating
ong Island University at C.W. Post Campus)
agency (Nassau BOCES) to synergistically
ining efforts.
aintain a demonstration practicum site which
l and behavioral variables ascertained in

impact of a collaborative research training
ching and administrative trainees in special

lement mechanisms for the two collaborative
Island University at C.W. Post Campus) to
roject's research and training efforts and

The overall plan consisted of five phases of collaborative activities. They were: 1) determination by experts in the field of most effective microcomputer practices 2) assessment of implementation of effective microcomputer practices in school sites, 3) development of a demonstration site, 4) development, implementation and evaluation of a college/local school district/intermediary educational agency collaborative model for preservice and inservice training, 5) documentation and dissemination of materials pertaining to the implementation of microcomputer technology.

PHASE ONE

METHODOLOGY - PHASE ONE: DETERMINATION BY EXPERTS OF MOST EFFECTIVE MICROCOMPUTER PRACTICES

In order to determine the categories of most effective microcomputer implementation practices for special education, exploratory site visits were conducted at three local suburban school districts, coupled with an intensive review of the literature. The above led to the determination of structural, contextual and behavioral dimensions necessary for ascertaining criteria to be used in effective microcomputer implementation as follows: 1) administrative policy and budgetary considerations, 2) administrative management, 3) classroom management, 4) hardware, 5) software, 6) instructional issues, 7) staff development, and 8) affiliations. Then, activities for effective microcomputer implementation within each of these eight areas were identified.

A five-point Likert rating scale was developed which delineated these eight areas and the specific items within each of these areas. Instructions were to circle the appropriate number that best described the importance of each of the items as they pertained to most effective implementation practices concerning microcomputer technology within special education school

settings (see Appendix A for Project INTERFACE Likert Expert Rating Scale). This rating scale was then sent to 53 experts in the field of microcomputer education from universities, school districts and research firms (see Appendix B for List of Experts). Twenty-five respondents completed the rating scale, including: 13 from universities, 5 from school districts, and 7 from research firms. Shown in the tables of results are the percentage of experts who rated items on the two highest points of the five-point rating scale.

RESULTS - PHASE ONE: DETERMINATION BY EXPERTS OF MOST EFFECTIVE MICROCOMPUTER PRACTICES

Administrative Considerations

Table 1 presents the experts' ratings of eleven items concerning administrative and budgetary considerations as related to most effective microcomputer implementation in special education. Almost all respondents stated that both the implementation of a districtwide needs assessment and written long- and short-range objectives were most important for effective implementation. Over half of the experts agreed that it is important for a district to have a written policy and/or philosophy for the effective implementation of microcomputers. Few experts thought it important that key issues should emanate from the Central Office level or that a written history of the microcomputer program is as necessary for implementation practices. Most of the experts felt the need for specific budgetary allocations for each aspect of effective microcomputer implementation and for incremental budgetary increases. Almost all of the experts agreed that some form of a systematic evaluation was necessary. Formative evaluation was rated as more important than summative evaluation.

Table 1

Administrative and Budgetary Considerations

Considerations	Percentage
Policy and administrative issues	
Districtwide needs assessment	87%
Long- and short-range goals	87%
Written philosophy/policy	59%
Key issues emanate from Central Office (not building level)	27%
History of program	13%
Budgetary issues	
Specific budgetary allocations	82%
Incremental increases in budgetary allocations	79%
Evaluation issues	
Formative evaluation	95%
Systematic evaluation method	83%
Both formative and summative evaluation	78%
Summative evaluation	61%

Note - The percent refers to the percentage of experts that rated the category as important to effective microcomputer implementation in special education.

Administrative Managerial Considerations

Table 2 presents the experts' ratings of six items concerning administrative management considerations as related to effective microcomputer implementation in special education. More than three-quarters of the experts felt it important that a districtwide special education microcomputer coordinator position be established with a written job description. Also, about three-quarters of the experts deemed it important for a district to have definite maintenance contracts and policies as well as some kind of appropriate information dissemination. Slightly fewer than half of the experts felt that it was important for effective implementation to

employ a building level coordinator or additional microcomputer special education personnel.

Table 2

Administrative Managerial Considerations

Considerations	Percentage
Districtwide coordinator	78%
Written job description (for coordinator)	78%
Maintenance contracts and policies	76%
Information dissemination	72%
Building-level coordinators	48%
Additional personnel	48%

Classroom Management Issues

Presented in Table 3 are the experts' ratings of four items of classroom management considerations as related to effective microcomputer implementation in special education. A majority of the experts agreed that it is important to have classroom management rules posted in all special education microcomputer rooms. Fewer than half of the experts felt it important to establish guidelines for the physical arrangement of the microcomptuer room, to have written health and safety statements regarding the utilization of microcomputers within the special education program and within the special education learning center.

Table 3

Classroom Management Issues

Issues	Percentage
Posted classroom management	79%
Guidelines - room arrangement	48%
Health - safety statements	39%
Utilization of special room	32%

Hardware and Software Issues

Table 4 presents the experts' ratings of six items related to microcomputer hardware and effective implementation in special education. Most of the respondents were in agreement that a district committee for the review and selection of hardware be established and a written hardware inventory be developed and located in both the Central Office and in each school building. Also, a large majority of the experts agreed that it was important that separate computers be used for instructional and administrative purposes. About half of the experts viewed written criteria and guidelines for the acquisition of hardware as important.

Table 4

Hardware Issues

Issues	Percentage
Committee	83%
Hardware inventory (located in Central Office and building locations)	83%
Hardware inventory	82%
Separate computers for instructional and administrative purposes	81%
Acquisition guidelines	52%

Presented in Table 5 are the experts' ratings of seven items concerned with software considerations as related to effective microcomputer implementation in special education. A large majority of the experts agreed that it is important to establish a committee for the review and selection of software and to establish guidelines for the acquisition of software in order for effective implementation to be realized. Most were in agreement regarding the importance of developing a central software inventory and library (as opposed to individual teacher storage).

Table 5

Software Issues

Issues	Percentage
Software library and cataloging	89%
Software inventory	88%
Committee for review	86%
Acquisition guidelines	86%
Software inventory located in central place	78%
Software inventory in a Central Office	70%
Software inventory at the building level	22%

Instructional Issues

Presented in Table 6 are the experts' ratings of seven items concerned with instructional considerations and effective microcomputer implementation in special education. Almost all of the experts were in agreement as to the critical importance of attending to student/computer ratios and teacher-student ratios for the effective implementation of microcomputers. Most

experts agreed that student learning styles and handicapping conditions were important considerations. Also, computer integration into content areas was deemed important for effective implementation. Less than half of the experts felt it important for student IEPs and student schedules to be computerized.

Table 6

Instructional Issues

Issues	Percentage
Attention to student/computer ratio	96%
Computer integration of content areas	92%
Attention to teacher/student ratio	91%
Consideration of student learning styles	91%
Consideration of student handicapping condition	91%
Computerized IEPs	48%
Computerized student schedules	30%

Staff Development Issues

Presented in Table 7 are the experts' ratings of eight items concerning staff development issues. Budgetary allocations for in-service training and workshops or clinics were rated important by all experts. In-service training within the district was rated important for effective implementation by almost all the experts, whereas training at colleges or universities was rated important by three-fourths of the experts. Regarding the areas of computer literacy incentives for teachers, a large majority of the experts deemed it most important for effective implementation.

More specifically, over two-thirds of the experts deemed it important that college credit, step credit and released time be used as computer literacy incentives. Fewer than half of the experts were of the opinion that teacher computer certification and in-house software development were deemed important for effective implementation.

Table 7

Staff Development Issues

Issues	Percentage
Budgetary allocations for in-service	100%
Workshops.clinics	100%
In-service within district	96%
Literacy incentives	95%
a. released	90%
b. step credit	75%
c. college credit	73%
In-service college/university	74%
Teacher computer certification	46%
Encouragement of in-house software development	27%

Affiliations' Issues

Presented in Table 8 are the experts' ratings of five items concerning importance of affiliations as they impact on microcomputer implementation. Most experts did not view contract or policies related to affiliations as important to microcomputer implementation in special education. More specifically, fewer than half of the experts viewed the following affiliations as important: inter- and intradistrict networking; contracts/policies

with regional education agencies, business and/or industry, and PTA/Adult Education divisions.

Table 8

Affiliations Issues

Issues	Percentage
Networking intradistrict	45%
Networking interdistrict	45%
Contracts/policies with Board of Cooperative Educational Services (BOCES)	44%
Contracts/policies with business and/or industry	43%
Contracts/policies with PTA/Adult Education	40%

In summary, regarding administrative policy and managerial issues, it appears that the majority of the experts are in agreement that a formal districtwide needs assessment coupled with long- and short-range goals and a written philosophy/policy statement are important for effective implementation of microcomputers in special education.

Specific budgetary allocations with incremental increases were rated as important for effective implementation. Systematic evaluation of all aspects of the microcomputer program (including both formative and summative evaluation components) was also deemed critical by the experts.

A districtwide coordinator position for microcomputer/special education with a written job description was considered most important for effective implementation. On the other hand, the employment of building level coordinators and/or additional microcomputer/special education personnel were felt to be less important. Regarding other administrative managerial

matters, definite maintenance contracts and policies as well as some kind of consistent information dissemination efforts were deemed important for effective implementation to occur.

The majority of the experts are in agreement that written classroom management rules need to be posted in all of the special education microcomputer rooms for effective implementation to occur. On the other hand, specific guidelines for the physical arrangement of the microcomputer room or written health and safety statements were felt to be less important for effective implementation.

Regarding hardware considerations, it appears that the majority of the experts are in agreement that a districtwide committee for the review and selection of hardware be established and a written hardware inventory be developed and located in both Central Office and in each building in the district. It was also considered important for a district to have stated written criteria and guidelines for the acquisition of hardware. Computers were viewed as desirable for both instructional and administrative purposes with separate computers used for each of these functions.

Regarding software considerations, the majority of experts agreed on the importance of establishing a committee for the review and selection of software and of establishing guidelines for the acquisition of software. In addition, they agreed that the development of a written software inventory coupled with an appropriate cataloging and storage system/library should be located in the Central Office and not at the building level.

A number of instructional factors pertaining to effective microcomputer implementation were also rated as important by the experts. These instructional factors included: student/teacher ratios; consideration of student

learning styles and handicapping conditions; and computer integration into content areas. On the other hand, computerization of student IEPs and schedules were felt to be less important in the effective implementation of microcomputers in special education.

Computer literacy incentives for teachers, in the form of college and/or step credit and released time, were deemed important. Moreover, in-service training (within the district and at colleges and universities) as well as budgetary allocations for the above were viewed as critically important to effective implementation. On the other hand, computer certification for teachers and the encouragement of in-house software development by staff were not deemed important for effective microcomputer implementation.

Lastly, networking with other districts or regional education agencies as well as developing contractual agreements with outside sources were not deemed to be important for effective implementation.

School districts ready to integrate microcomputers into their ongoing special education programs could make use of the information from this survey to prioritize implementation strategies. If implementation has already occurred, effective strategies could be used to improve the program. It is recommended that school administrators familiarize themselves with those strategies viewed as most important by over 70% of the experts and to plan their implementation process based on the views of the experts as well as on their local needs and resources. The next two phases of Project INTERFACE illustrated how local school districts assess and prioritize their microcomputer implementation strategies based upon their own needs as well as upon those strategies viewed as important by over 75% of the experts.

METHODOLOGY: PHASE TWO - ASSESSMENT MICROCOMPUTER PRACTICES IN SCHOOL SITE

The purpose of Phase Two of Project INTERFACE was to assess microcomputer practices in six school sites in order to select a demonstration site for the implementation of the "most effective" microcomputer practices determined by the experts in Phase One. An assessment of school district needs consisting of school site observations and numerous interviews with administrators and teachers was conducted by project staff.

The needs assessment was conducted at six schools (3 suburban local district schools and 3 suburban Board of Cooperative Education schools) in the spring of 1985 prior to the technical assistance effort provided in the fall of 1985 to the selected demonstration site.

Structured interviews and observations schedules were developed after preliminary site visits were made to the six selected schools participating in the project. During the preliminary site visits, Project INTERFACE staff became acquainted with the school administrative and teaching staff and with the progress of the schools' microcomputer implementation effort to date. During the site visit, specific written material on the sites' microcomputer implementation effort was requested and if existent was retrieved by Project INTERFACE staff. (See Appendix C for Project INTERFACE: Preliminary Survey.) This material enabled the project staff to become more familiar with the specific site's implementation effort prior to conducting the in-depth interviews and observations. The in-depth interview and observation schedules were constructed in order to obtain information from all types of school personnel on specific implementation issues related to the integration of microcomputer technology

into ongoing educational programs prior to offering technical assistance. The major emphasis of the in-depth interview and observation procedure was to carefully document teaching, administrative, organizational and logistical factors related to the implementation of microcomputer instruction at the specific site. The observation instrument included both checklist and rating scales as well as a format for narrative descriptions. (See Appendix D for Project INTERFACE: Observation Instrument.) The in-depth interview schedule included questions related to each of the eight aforementioned areas deemed important for microcomputer implementation in special education (See Appendices E and F for Project INTERFACE: In-depth Interview Instruments.) The following implementation factors were examined by observation and/or in-depth interviews.

1. Staff Factors.

   - The role, or roles, of those responsible for the equipment and how these people emerged as the responsible ones
   - The number of people assigned responsibility
   - The amount of time required
   - Staff-training required at all levels
   - How leadership patterns and hierarchies develop
   - How staff responsibilities interact with location of equipment and scheduling divisions
   - Staff attitudes toward computer implementation

2. Location of the computer equipment and amount of equipment

   - Numbers of computers for each school building and number of computers per student population
   - Location of computers
     - number in resource room
     - number per classroom

3. Student Characteristics

   - Handicapping conditions and student characteristics considered inappropriate, if any, for working with the computers
   - Type of handicapping conditions and severity of handicaps included

°Special adaptations made for severely handicapped, physically handicapped, etc.
°Ages of students

4. Scheduling Factors

°Number of students using computers at the same time (number in resource room or in each classroom)
°Number of students assigned to each computer
°Number of times per week for each student
°Length of time on machine in relation to subject areas, goals set for student, and progress toward goals.

5. Decision-making Process and Correction Process

°How are decisions made - by whom?
°How are mistakes recognized and corrected?

6. Instructional Software

°Type of software for each subject area at each school and how complete it was
°Where it was obtained
°Adaptations for use with handicapped
°In-house development of software - how this was accomplished, by whom?
°The number of teachers who really become involved with developing software
°How much contact develops with other special education programs in sharing software

Several days were spent in each of the six sites by the project director and research associate for the collection of observation and interview data. This interview and observation information was then analyzed by the project staff in the summer of 1985.

RESULTS: PHASE TWO - ASSESSMENT OF MICROCOMPUTER PRACTICES IN SIX SCHOOL SITES

Administrative Policy and Budgetary Considerations

Regarding implementation of a districtwide need assessment, one-half of the six schools had begun to partially implement a districtwide need assessment and the other one-half were in the very early preliminary

stages. The majority of the schools were also in the very early preliminary stages of establishing a written special education/microcomputer philosophy or policy, with three of the six schools in the early stages of formulating written long- and short-range goals and objectives for the integration of microcomputers within the special education curriculum, two schools having partially implemented their goals and objectives and one school where formulation and implementation had not occurred.

Regarding the conceptualization and implementation of a systematic method for evaluating the microcomputer/special education program, four of the six schools had just begun either formative or summative evaluation designs and the other two had not begun evaluation at all.

Specific budgetary allocations for each aspect of implementation, i.e., hardware, software, staff development, etc. had been partically put in place at four of the six schools and barely in place at the other two. Increases in budgetary allocations for incremental microcomputer implementation was partially in place at four of the schools, barely in place at one school and not implemented at all in the sixth school.

Administrative Management

The employment of a districtwide special education/microcomputer coordinator or special education technologist was partially in place at four of the six schools. Furthermore, the employment of a building level special education/microcomputer coordinator or special education technologist was fully in place in three of the schools and partially in place at the other three. On the other hand, written job descriptions for the above personnel had only been partially implemented in three of the schools and

barely implemented at all in the other three. Furthermore, the employment of additional microcomputer/special education personnel, i.e., Learning Center teachers, aides, clerks, etc. had hardly occurred in four of the six schools.

Some form of information dissemination for microcomputer/special education news, i.e., monthly newsletter, monthly meetings, etc. had been partially put in place at two of the schools and hardly implemented at the other four. Maintenance contracts and policies had been partially implemented at all of the schools.

Classroom Management

Written health/safety statements regarding the utilization of microcomputers within the special education program had been partially implemented in two of the schools and scarcely not implemented at all in the other four. Furthermore, for the most part, posted classroom management rules in all of the special education/microcomputer rooms were not in place in the schools. In addition, specific guidelines for the physical arrangement of the microcomputer room were scarcely to not in place in four of the schools and partially implemented in the other two.

Hardware Issues

An established committee for the review and selection of hardware was hardly in place in all of the schools. Furthermore, written criteria/guidelines for the acquisition of hardware was not in place in most of the schools. On the other hand, a written hardware inventory had been partially implemented in almost all of the schools. Regarding the utilization of the microcomputer system for both instruction and administrative purposes, four of the schools were not using it for both purposes while the other two schools had these dual uses partially implemented.

Software Issues

An established committee for the review and selection of software was barely in place in five of the six schools. Furthermore, written criteria/guidelines for the acquisition of software had scarcely been implemented in three of the schools and hardly implemented in the other three; the same was true for the cataloging and storage in a software library (as opposed to individual teacher storage.)

Instructional Issues

Computerization of student IEP record forms had not been implemented in the majority of schools, with only one school having partially implemented a computerized IEP record form.

Integration of content areas into the microcomputer program had begun to be implemented in the majority of schools with only one school having not started this integration of content areas into the computer program. The matching of student learning styles with the choice of computer software was partially in place in the majority of schools and barely in place in one school. Furthermore, the majority of schools had partially begun the matching of student handicapping conditions with appropriate software.

Staff Development

Teacher incentives for computer literacy were partially in place in half of the schools and had barely begun in the other half. District microcomputer/Special Education in-service programs were fully implemented in half of the schools and hardly implemented in the other half. The same was true for Microcomptuer/Special Education workshops/clinics for staff, which were fully implemented in half of the schools and not implemented

in the other half. Budgetary allocations for these in-service programs were partially implemented in all of the schools. Lastly, the encouragement of in-house software development had not begun in the majority of the schools, with only one school having some partial implementation of in-house software development.

Affiliations

Establishment of contract/agreements or policy statements with business/industry, PTAs; adult education divisions and BOCES had been scarcely or not implemented at all in the majority of schools, with only one school having partially implemented this type of affiliation. Interdistrict networking had not begun in the majority of schools, with only one school having this process partially in place. Furthermore, intradistrict networking had hardly been implemented in the majority of schools.

In summary, if one takes the experts' comments in Phase One pertaining to those variables important to effective microcomputer implementation practice into consideration and compares it with those practices already in place in the six school sites, it appears that the following improvements in microcomputer implementation practices appear warranted.

It seems that within the area of administrative policy and budgetary considerations, there is a need for further implementation in all areas with a greater emphasis on technical assistance pertaining to: the establishment of a districtwide needs assessment, written long- and short-range goals and objectives, budgetary allocations for microcomputer implementation and a systematic method for the evaluation of microcomputer/special education programs.

Within the administrative management area, there is a need for further implementation in all areas with a greater emphasis needed for technical assistance regarding: the employment of and written job descriptions for districtwide microcomputer specialists and some form of information/ dissemination effort as well as maintenance contracts and policies. Regarding the classroom management domain, there is a need for further implementation in all areas with a greater emphasis warranted for technical assistance pertaining to classroom management rules to be posted in all of the special education/microcomputer rooms.

Regarding the hardware domain, there is a need for further implementation in all areas, with a greater technical assistance emphasis needed to establish a committee for the review and selection of hardware. Also a written hardware inventory and utilization of the computer system for both instruction and administrative purposes needs to be addressed.

Within the software domain, there is a need for further implementation in all areas with a greater technical assistance emphasis needed to establish a committee for the review and selection of software. Written criteria/ guidelines for the acquisition of software also needs to be addressed. Moreover, some technical assistance appears to be needed in certain schools to develop a written software inventory and a process for the cataloging and storage of software in a software library.

Within the instructional issues areas, there is a need for further implementation in all areas with a particular need for technical assistance in computer integration of content areas; with an emphasis placed on student/ teacher ratios, indivudal student learning styles and handicapping conditions.

Furthermore, within the staff development domain, there is a need for implementation in almost all of the areas in half of the schools with a greater emphasis on technical assistance warranted in specific schools regarding the following: provision of teacher incentives for computer literacy; provision of district microcomputer/special education in-service programs and workshops/clinics for the staff with budgetary allocations for the above.

Regarding affiliations, it was not deemed critical by the experts for implementation. Therefore, an emphasis on technical assistance in this area does not appear to be warranted.

PHASE THREE: DEVELOPMENT OF DEMONSTRATION SITE

Based upon the level of microcomputer implementation of "most effective practices" attained by the six schools as of the spring of 1985, coupled with the level of motivation of each of the school districts for the attainment of further microcomputer implementation practices, a demonstration site was chosen in the summer of 1985. This demonstration site was provided technical assistance by Project INTERFACE staff in the school year 1985-1986 in order to enhance their microcomputer implementation effort.

The selected suburban school district, situated on the north shore of Long Island in Western Suffolk county is a dynamic, active community of 37,000. Educational offerings in the schools are broad in scope. A basic education is offered at all levels, and augmenting it is a wide range of learning modes and elective programs to meet the interests, abilities, needs and career goals of district pupils. In 1984, the high school was named one of the best in the United States, and in 1985 one of the junior high schools was selected among the ten best in New York State. A steady decline in enrollment (5820 projected for 1986-87) has allowed innovative use of school space, new programs and a reduction in class size.

The aforementioned school district administrators worked consistently and cooperatively with the technical assistance staff of Project INTERFACE in the 1985-1986 school year. The progress made by the demonstration site in microcomputer implementation will be highlighted below through a comprehensive description of the services provided by Project INTERFACE to this site.

Firstly, the results of the Phase Two needs assessment were shared with school administrators in this district in the summer of 1985 (prior to the technical assistance effort begun in the fall of 1985) and consisted of: (1) verbal feedback provided to the principal of the school, and (2) a written summary of the Phase Two observation and interview results coupled with the Phase One experts' survey responses to the eight microcomputer implementation areas.

Presented below are the written observation visit narrative feedback as well as the summary of expert, administrator and teacher interview responses shared with the demonstration site.

Written Observation Visit Results

Results from three separate observations of special education students using microcomputers from the demonstration site are presented below. All observations occurred during the spring of the school year prior to the technical assistance year. Observations lasted between 30-40 minutes. The following served as observation rooms: a kindergarten classroom, a resource room, and a third-fourth grade classroom. All observational data was recorded on the Project INTERFACE Field Observation Form; an eleven page form including checklists, rating scales, and narrative descriptions.

Another observation was rated as organized since the teacher had the microcomputer and software prepared for student use. This teacher chose to circulate between the microcomputer located in one room of a three-room suite and another one of these rooms. This arrangement did not pose any problems since an aide did remain in the one room to supervise students not using the microcomputer. The microcomputer is in a small room (hallway) of this suite. This arrangement is adequate and provides privacy and an environment free of distractions; however, this hallway is a little crowded. With a larger group of students this area may be too crowded and a less than adequate environment might prevail. However, for the pair of students observed this environment was functional.

One observation was rated less organized since the teacher was learning about the hardware, software, etc. while simultaneously trying to teach the students about the microcomputer. This teacher also had to circulate between the microcomputer and the rest of the class. The aide was supposed to be in charge of the students not using the microcomputers; however, the students kept calling the regular classroom teacher to their desks. The size of the classroom and location of the microcomputer were rated as adequate; however, it seemed that it would be beneficial to move the microcomputer into a corner of the classroom to better implementation purposes. During the observation, it appeared that the present room arrangement and location of the microcomputer were not totally conducive to learning. Some of the students working independently at their desks were distracted by the student using the microcomputer and vice versa. This teacher indicated that she would like more training in the use of the microcomputer. This may be the case with other teachers who do and do not elect to use the microcomputer in their classroom.

The school site where the observations occurred housed eight microcomputers (all on rolling tables or carts) in the library; these microcomputers may be signed out by any teacher for use in individual classrooms, or an entire class may receive a microcomputer lesson in the library taught by the library/media specialist. The library appeared somewhat crowded when all eight microcomputers were located there. There is a large storage room adjacent to the library that could easily serve as a "microcomputer room" accommodating all of the school's microcomputers, if so desired.

Due to the flexibility of the microcomputer sign-out procedure, there is no set schedule for microcomputer usage. As a result, some teachers may utilize the microcomputers quite often while others may rarely use the microcomputers. Microcomputer use is left up to the discretion of each teacher.

Procedures used during microcomputer lessons ranged from very organized to less organized. Specifically, one observation was rated as very organized as the classroom teacher had the microcomputer (software, etc.) set up in advance for the students. Students are called back to the microcomputer individually/or in small groups in a very organized manner. The classroom aide effectively supervised the remainder of the class, (all students gathered around a large table) thus allowing the teacher to devote her entire ~~en~~ergies and attention to the microcomputer. In addition, the microcomputer was located in a back corner of the room far enough away from the rest of the class, minimizing possible distractions and creating a more than adequate setting.

During all three observations, hardware, keyboards, and screens were directly in front of the students. Chairs and/or tables were not adjustable causing some of the microcomputer-using-students to look up at the screen or stand in order to be comfortable. If possible, adjustable or proportioned tables and chairs, based upon student size, should be utilized. Copyholders were not available for student use during this observation. Copyholders would be helpful when students need to refer to worksheets so that papers may be held securely within view of the student instead of being balanced on the microcomputer or the student's lap.

Observations indicated that student progress is not formally monitored. The observers were not aware of teachers recording individual student progress, sofware programs completed, etc. after each student completed work on the microcomputer. It was suggested that formalized monitoring by teachers and/or students in the form of charts, logs, index cards, etc. would add to a more organized, efficient and motivating microcomputer implementation process.

Pupil behavior was also observed. This was done to determine whether or not certain student behaviors could possibly be linked to organizational administrative or other practices. As expected, a wide variation in behavior was observed. Behavior was numerically rated from 1-5 with 5 representing the positive end of the scale and 1 representing the negative end of the scale. The following behavioral dichotomies were rated: apathetic/alert, obstructive/responsible, uncertain/confident, dependent/initiating. Overall, scores ranged from 2.5-5 as expected. The observers concluded that variations in behavior are more the result of differing student attitudes and interest levels concerning microcomputers rather than specific administrative and organizational procedures.

Another area of concern is related to software issues. As the result of observations and informal discussions it was noted that although software was intended to be housed in the library/media center, some software was scattered throughout the building. This could create difficulty when attempting to locate desired software programs. In fact, some teachers did not consider software "very accessible" (the highest rating) for this reason. It was suggested that the library/media center's sign-in and out procedure for software be firmly re-instituted. With this procedure in place, every staff member would be informed to the location of each and every software program.

With reference to the adequacy of the software library, a range of opinions was recorded. Two of the teachers whose classes were observed considered the present software library inadequate. Specifically, these teachers stated that more age-appropriate software was needed as well as a larger variety of educationally sound software programs. These opinions were confirmed upon observation. One of the teachers whose class was observed indicated that the software library was adequate. This appears to be the result of the teacher's ability to author, adapt, modify, and personalize software for his own teaching needs. Overall, the three teachers whose classes were observed at this local elementary school used instructional software more often than microcomputer games, with the Bank Street Writer being utilized the least. However, this pattern of type of software employed should not be generalized to the rest of the school, as only three observations were conducted.

As stated above, this written observation was shared with school district administrators in order for them to receive an objective outside view of their microcomputer implementation process to date.

Furthermore, information was gathered on the implementation process from teachers and administrators in an objective manner through interview procedures in order to round out the district's view of their implementation process.

Narrative Feedback of Experts, Administrators and Teachers

Further information regarding specific staff opinions in the areas of: (a) administrative policy and budgetary considerations, (b) administrative management, (c) classroom management, (d) hardware issues, (e) software issues, (f) instructional issues, (g) staff development, and (h) affiliations were gleaned from the interviews of teachers and administrators and are summarized in chart form in the same way in which it was reported to the school's administrative staff (See Appendix G for Complete Narrative Feedback Chart.) By presenting the information according to the specific eight areas of microcomputer implementation, school personnel were more able to set forth their specific technical assistance needs based on information gathered from their own staff. Therefore, the information gathered from the interviews, functioned as a needs assessment in establishing priorities for the technical assistance effort provided by Project INTERFACE. Furthermore, at the time of feedback, school administrative staff were also given the information from the expert ratings on the level of importance of specific implementation processes. Therefore, they were also able to integrate this information into their prioritization of the focus for the technical assistance visits by Project INTERFACE. Figure I shows the format of feedback for the interviews for one of the eight areas of Administrative Policy and Budgetary Considerations.

FIGURE 1

NEEDS ASSESSMENT RESULTS: EXPERT AND DISTRICT RESPONSES

AREA	ADMINISTRATION RESPONSES	TEACHER/AIDE RESPONSES
I. <u>Administrative Policy Budgetary Consideration</u> 1. Districtwide needs assessment 87% of experts thought it most important to conduct a districtwide assessment.	Administrators agreed that a districtwide needs assessment had not been developed and implemented recently.	Teachers agreed that a districtwide needs assessment specifically for computers in special education had not been done. Yet, a few teachers mentioned that their input was informally requested, and as a result curriculum was developed and a new staff member hired in the microcomputer/special education area.
2. Key issues and decision making re: Microcomputer implementation emmanating from the Central Office as opposed to individual buildings. 45% of experts thought it important for key issues and decision making to emmanate from Central Office.	The majority of the administrators felt that Central Office (C.O.) played a major role in key decision making issues; however there seems to be informal building level input from teachers.	The majority of the teachers felt that Central Office plays a major role in key decision making issues: however there seems to be some building level teacher andadministrator input.
3. An established, written special education microcomputer philosophy or policy. 59% of the experts thought it most important for districts to have a written philosophy or policy regarding microcomputer implementation.	Administrators agreed that no written special education microcomputer philosophy or policy exists in their district to date. Yet they did allude to a written computer policy for the district	Teachers agreed that no written special education microcomputer philosophy or policy exists within their district to date. Yet a few did allude to a written computer policy but not specifically geared to special education.
4. Written long- and short-range goals and objectives for the integration of microcomputers within the Special Education curriculum. 87% of the experts thought this item is most important for integration of microcomputers into curriculum.	Administrators agreed that long- and short-range goals and objectives for the integration of microcomputers within the Special Education curriculum have been developed. One of the two administrators mentioned the need for revamping these goals.	Teachers agreed that long- and short-range goals and objectives have been developed but not specifically for Special Education. One of the teachers mentioned that though the goals had been developed they had not been followed as stated.

Figure I, continued

AREA	ADMINISTRATION RESPONSES	TEACHER/AIDE RESPONSES
5. A written narrative history of the district's microcomputer/special education program.		
6. A systematic method for evaluating the microcomputer/special education program. a. formative evaluation b. summative evaluation for accountability purposes c. both 83% of the experts thought it most important for districts to have a systematic method for evaluation with 94% for formative evaluation and 61% for summative evaluation.	Administrators agreed that it is important to have an evaluation plan. It is not a high priority for them at this time, since they are at the stage of purchasing computer hardware.	Teachers agreed that an evaluation was important to effective microcomputer implementation. Yet, they felt that a program needed to be in place before the evaluation plan.
7. Specific budgetary allocations for each aspect of implementation i.e., hardware, software, staff development, etc. 82% of the experts said it was most important to have specific budgetary allocations for microcomputer technology implementation.	Administrators stated that there are not specific budgetary line items for microcomputers in special education; that each building is given a lump sum of money for microcomputer implementation. The only exception noted was maintenance for which a line item exists.	Not asked of teachers.
8. Increases in budgetary allocations for incremental microcomputer implementation. 78% of the experts felt it most important to have incremental increases in budgetary allocations.	Administrators reported that there are no preplanned budgetary allocations for incremental microcomputer implementation.	Not asked of teachers.

Formative Evaluation Technical Assistance Log

After above feedback was given to school administrative staff by Project INTERFACE; a technical assistance plan and formative evaluation log were put in place for the school district (See Appendix H for Complete Formative Evaluation Log.)

Figure 2 presents a section from the Formative Evaluation Log for the Administration and Budgetary Policy area. Of the items shown in Figure 2, the four starred items were selected by the district as goals for the 1985-1986 school year. These goals were chosen based on the experts' ratings of critical importance and on the districts' own personal needs. Progress in each of these areas was recorded by Project INTERFACE technical assistance staff based on observations/interviews from three technical assistance site visits. Progress was recorded in two ways: (a) a narrative description of what had taken place at each visit, and (b) a progress rating using a four-point scale-(1) fully completed, (2) partially completed, (3) just begun, and (4) not started.

Figure 2

FORMATIVE EVALUATION

SCHOOL DISTRICT

AREA	INITIAL GOAL SETTING DATE	DATES OF TECHNICAL VISITS AND SUBJECT MATTER DISCUSSED	TECHNICAL ASSISTANCE AND/OR EVALUATION VISITS		
			Janaury 1986	March 1986	June 1986
I. ADMINISTRATIVE POLICY BUDGETARY CONSIDERATION 1. Districtwide needs assessment. 87% of the experts thought it most important to conduct a districtwide assessment.	8/27/85	Principal generated a computer school-wide needs assessment which focused on the best possible use of computers for the school.		[1] A needs assessment for the school was completed. As a result three specific in-service meetings were held for teachers (software presentations.)	[1] The three planned workshops were completed. Teachers have indicated they wanted a full-time computer teacher for next year. For 1986/1987 a half-time teacher has been employed.
2. Key issues and decision making re: Microcomputer implementation emanating from the Central Office as opposed to individual buildings 45% of the experts thought it important for key-issues and decision-making to emanate from Central Office.		District has a decision-making process in place emanating from Central Office with input from building level.			

Figure 2 , continued

FORMATIVE EVALUATION

SCHOOL DISTRICT

AREA	INITIAL GOAL SETTING DATE	DATES OF TECHNICAL VISITS AND SUBJECT MATTER DISCUSSED	TECHNICAL ASSISTANCE AND/OR EVALUATION VISITS		
			Janaury 1986	March 1986	June 1986
3. An established special education microcmputer philosophy or policy. 59% of the experts thought it most important for districts to have a written philosophy or policy regarding microcomputer implementation		District has written microcomputer policy but not specifically geared to special education. Not selected as a priority for this year.			
4.* Written long- and short range goals and objectives for the integration of microcomputers within the special education curriculum. 87% of experts thought this item is most important for integrating of microcomputers.	8/27/85	8/27/85-Technical assistant discussed with the principal the importance of goals and objectives related to school program and guided the student teacher to assist in this process. 10/24/85 - Principal and technical assistant established the importance of typing in specific goals and objectives to reflect the school's philosophy. It was felt that the student teacher would be able to give assistance with this task.	1/30/85 -Student teacher for Fall semester drafted a school philosophy for microcomputers with special education youngsters that would form the basis for the schools's written long- and short-range goals and objectives. 3	Principal has general goals and objectives for a computer program in place. Each special education teacher will write what he/she feels should be the goals and objectives for integrating technology into special education programs. These will then be incorporated into goals/objectives for the school. 2	Goals/objectives were written by the teachers of the school. Principal stated that this will probably be revamped next year. 1

Figure 2 continued

FORMATIVE EVALUATION

SCHOOL DISTRICT

AREA	INITIAL GOAL SETTING DATE	DATES OF TECHNICAL VISITS AND SUBJECT MATTER DISCUSSED	TECHNICAL ASSISTANCE AND/OR EVALUATION VISITS		
			Janaury 1986	March 1986	June 1986
5. A written narrative history of the district's microcomputer special education program.		There is a general written narrative history which is on file in the district and did not need any editing at this point until the end of the project year.			
6.* A systematic method for evaluating the microcomputer/special education program. a. formative evaluation b. summative evaluation for accountability c. both	8/27/85	8/27/85 - Principal sees the need for evaluation of microcomputer program and chooses with technical assistance to implement such an evaluation in the second half of the school year. 10/24/85 - BOCES evaluation specialists have begun to log all visits and collect documentation of implementation progress to date - which will be used in the formative evaluation to formally begin in the second half of the school year.	2 1/3/86 - Technical Assistant met with principal to discuss the formative evaluation format which will be delivered by 2/15/86 for principal's perusal with a technical visit to follow.	2 Project staff/technical assistant continues to meet on a bi-monthly basis with principal of school to review formative evaluation. Appropriate documentation is being accumulated.	1 Project/staff technical assistant met with principal and the formative evaluation has been completed for this project.

Figure 2, continued

FORMATIVE EVALUATION

SCHOOL DISTRICT

AREA	INITIAL GOAL SETTING DATE	DATES OF TECHNICAL VISITS AND SUBJECT MATTER DISCUSSED	TECHNICAL ASSISTANCE AND/OR EVALUATION VISITS		
			Janaury 1986	March 1986	June 1986
7.* Specific budgetary allocations for each aspect of implementation i.e., hardware, software, staff development, etc. 82% of the experts said it was most important to have specific budgetary allocations for microtechnology implementation.	8/27/85	8/27/85 - Principal designated a budget line for software in the school budget and expressed a need to further investigate fiscal issues. 10/24/85 - Principal is trying to work with the new district microcomputer coordinator in developing a building budgetary procedure for microcomputer concerns.	2 1/30/85 - There is money to purchase software. Principal expects to receive new computers to complement the school program.	1 Three new Apple IIEs have been received at the school since 9/86. One Apple IIE is on order strictly for administrative use. (There are ten IIEs presently and three Pet Commodores in the skills center.)	1 Six more Apple IIEs have been ordered for next year. In addition 25 electric typewriters have also been ordered to teach keyboarding in grades 3-6 for all students. Classroom teachers and the computer teacher will be offered a workshop.
8. Increases in budgetary allocations for incremental microcomputer implementation. 78% of the experts felt it most important to have incremental increases in budgetary allocations.					

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Upon completion of the project, the school administrative staff and the Project INTERFACE technical assistant met to discuss implementation progress to date and to make recommendations for the continuance of effective microcomputer integration efforts for the following year. The formative evaluation log and follow-up feedback session proved invaluable for this purpose.

Table 9 presents a summary of the progress made by the demonstration site as shown in the Formative Evaluation Log for each of the eight microcomputer implementation areas. The total number of items, the number of items deemed critical for implementation by the experts, and the number of items selected as goals for school year 1985-1986 and completed within the same school year is also shown. Of the total of 47 items, 30 were deemed critical for implementation by the experts. Of these latter items, 23 were selected as goals for the 1985-1986 school year by the demonstration site administrator. Of the 23 goals selected, 14 were fully completed.

Table 9

Summary of Formative Evaluation Log

Area		Number of Items In Total	Number of Items Deemed Critical by over 70% of Experts	Number of Goals Selected	Number Fully Completed
I.	Administrative Policy/ Budget	8	4	4	4
II.	Administrative Management	6	4	4*	3
III.	Classroom Management	4	1	1*	1
IV.	Hardware	6	5	4	2
V.	Software	6	6	5	3
VI.	Instructional Issues	7	5	4*	1
VII.	Staff Development	7	5	1	0
VIII.	Affiliations	3	0	0	0
	Total	47	30	23**	14

* One goal selected from this group was not deemed critical by the experts

** Three out of the 23 goals selected for the school year were not deemed critical by the experts

It seems that approximately one-third of the implementation goals deemed critical by the experts can be targeted within a school year for a well motivated school district site. For the most part, progress within each of the selected goal areas can also be realized within the school year with over half of the selected goals fully completed within the school year.

More specifically, it appears that goals in the administrative and classroom management areas can be more fully realized within a year's time frame than goals pertaining to hardware, software, instructional, and staff development issues. These latter issues require additional budgetary

allocations, coupled with the development of committees, commitee meetings, and at times a more lengthy decision-making process. Though progress had been made in these latter goal areas within the year's duration, it seems to take more time to fully realize these types of goals within a school district setting.

METHODOLOGY - PHASE FOUR: DEVELOPMENT AND IMPLEMENTATION OF THE COLLEGE/ LOCAL DISTRICT/INTERMEDIARY EDUCATIONAL AGENCY COLLABORATIVE MODEL FOR PRE- AND IN-SERVICE TRAINING OF TEACHERS AND ADMINISTRATORS.

During the course of the two Project INTERFACE planning and implementation years, the INTERFACE project director met with the L.I.U.-C.W. Post assistant dean of the School of Education in order to keep him well-informed of all project findings emanating from the local school district field research effort.

From these collaborative feedback sessions, Project INTERFACE and L.I.U.-C.W. Post staff then began to synergistically redesign and implement a special microcomputer training program aimed at assisting institutions to train school personnel in the: (a) development and/or refinement of pre-service and in-service microcomputer programs that would better serve the needs of school personnel and special education students and in the (b) bringing of well-researched innovations to bear on training programs in order to meet school personnel needs and, thereby increase their capabilities to provide improved educational use of technology for educating handicapped persons.

More specifically, Project INTERFACE field research results were integrated into the L.I.U.-C.W. Post college-level microcomputer special education courses offered to administrative and teaching trainees. The project's findings were integrated into three levels of the college microcomputer special education curriculum, namely: Introductory level courses, Methods courses, and Student Teaching seminars. The topics which were covered in one or more of the above college-level courses were as follows:

-Microcomputer administrative policy as it relates to the
  a) need for a districtwide needs assessment and written goals and objectives for integrating technology into special education classes.
  b) need for districtwide system to evaluate the Special Education Technology program.
  c) need for districtwide budgetary allocations for microcomputer implementation strategies.

-Administrative management issues as it relates to the need for a districtwide microcomputer coordinator and a districtwide strategy of dissemination.

-Classroom management issues, including need for classroom management rules for microcomputer use; placement of microcomputers in classrooms and/or resource room.

-Hardware issues, including: need for a hardware review committee; need for a hardware inventory and control system; and need for separate computers for instruction and administrative uses.

-Software issues, including: need for software review committee; need for guidelines for acquisition of software; need for software inventory; and need for excessible location of software.

-Instructional issues, including: use of computerized IEPs; integration of content areas into microcomputer practices; consideration of student/teacher/microcomputer ratios, and student learning styles; and differentiated software uses, i.e. drill-and-practice, tutorial, simulation, etc.

-Staff development issues including: certification and/or incentives for teachers; in-service practices; budgetary staff development considerations; and software development issues.

-Affiliations on the school level as it pertains to microcomputers implementation practices.

RESULTS PHASE IV: EVALUATION OF THE COLLEGE/LOCAL SCHOOL DISTRICT/INTERMEDIARY EDUCATIONAL AGENCY/COLLABORATIVE MODEL FOR PRE- AND IN-SERVICE TRAINING OF TEACHERS AND ADMINISTRATORS

In order to determine the degree of competence of teaching and administrative trainees in microcomputer practices, competency checklists were developed by Project INTERFACE staff in collaboration with Long Island University, C.W. Post College campus. Competencies were constructed in each

computer coursework area offered at C.W. Post College for teachers and administrators in special education. These competency checklists were designed as four-point Likert rating scales in each competency area covered by the courses. Instructions for these rating scales were to circle the number of the level of competency that the student had attained at the time that the scale was utilized. Levels of competency ranged from extremely competent to adequately competent, fairly competent and then to not competent at all. Competencies were set up in hierarchical order, ranging from awareness and understanding of specific microcomputer practices to more advanced technical competencies which reflected "hands on" use of microcomptuers. (See Appendix I for Competency Rating Scales).

This rating scale was then distributed at the beginning and end of the summer of 1985, fall of 1985 and spring of 1986 semesters to trainees enrolled in the course entitled, Utilizing the Microcomputer in Special Education.

Results of Analyses of Student Competency Ratings

Competency data was collected from three groups of students (Group I - enrolled in the summer of 1985; Group II - enrolled in fall of 1985; and Group III - enrolled in the spring of 1986.) (See Appendix J for Tabular Descriptions of the Sample Groups.) Since Group III had fewer than five participants for whom competency data was collected, only Groups I and II were used for these analyses. T-test analyses were conducted on the Group I and II student competency rating pre- postdata. Results of these analyses are reported below.

As presented in Table 10, students rated themselves, on the whole, as significantly more competent in microcomputer practices after

completion of the course as compared to their level of competence at the start of the course. More specifically, at the beginning of the course, the average student ratings in microcomputer practices fell in the fairly competent to not competent range. At the end of the course the average student ratings fell in the adequately competent to fairly competent range.

Table 10

Students' Pre- and Postmeans for Competency Totals, t-Values, Df and Probability Levels

Group #	Pretest Mean	Posttest Mean	Gain	t	df	Probability
Group 1 (N=23)	59.4	50.4	9.04	4.94	22	.000*
Group 2 (N=6)	57.2	39.5	17.67	6.28	5	.002*

*sig. = .05

Note: The lower the mean score, the higher the competency rating.

Tables 11, 12, 13, and 14 present the specific areas of microcomputer competencies rated and those areas where significant growth was noted for Groups 1 and 2. As depicted in Tables 12, 13, and 14 significant growth was noted in the following competency areas:

- -understanding the role that the computer has in Special Education
- -knowing the major types of application of computers to special education
- -knowing related resources and how to obtain access to them
- -being familiar with a variety of computers and peripherals appropriate for exceptional individuals
- -knowledge of computer-assisted prosthetic devices for handicapped learners
- -ability to use authoring systems to create appropriate lessons

-ability to use the computer to input data of student responses
-knowing the roles of microcomputers in work and careers
-ability to prepare handicapped students for the possible vocational uses of microcomputers
-ability to use special networking, an electronic bulletin board and electronic mail service
-ability to conceive of future innovations in computer-related technology
-ability to consult with other school personnel on the possible use of computers with handicapped learners
-awareness of modified output devices for individual student's needs
-awareness of modified output devices for individual student's needs
-ability to use computer-managed instruction to monitor instructional process
-knowing related technolgoies such as videodisc, various video displays, robotics, etc.
-awareness of various computer-related prosthetic devices
-awareness of the possible future uses of technology with individuals with severe handicapping conditions.

Table 11
Competency Items With Significant Pre/Posttest Differences

	Items	Group 1 (N=23)	Group 2 (N=6)
1.	Understand the role that the computer has in Special Education.	*	*
2.	Know the major types of application of computers to Special Education, i.e., CAI, CMI, Simulation, etc.	*	*
3.	Know related resources and how to obtain access to them.	*	*
4.	Be familiar with a variety of computers and peripherals appropriate for exceptional individuals.	*	
5.	Know the current and potential impact of computers on society, education, and special education.		
6.	Knowledge of computer-assisted prosthetic devices for handicapped learners.	*	*
7.	Know related technologies such as videodisc, various video displays, robotics, etc.		*
8.	Know the roles of computers in work and careers and be able to prepare handicapped students for the possible vocational uses of computers.	*	*
9.	Be able to use special net, an electronic bulletin board and electronic mail service available via telecommunications.	*	*
10.	Ability to conceive of future innovations in computer related technology.	*	
11.	Ability to consult with other school personnel, i.e. administrators, school nurse, etc., on the possible use of computers with handicapped learners.	*	*
12.	Awareness of modified input devices for individual student's needs, i.e., micro-switches, touch screens, voice recognition, special keyboards.	*	*
13.	Awareness of modified output devices for individual student's needs, i.e., large type screen, voice synthesis.	*	*
14.	Ability to use computer managed instruction to monitor instructional process i.e., Aimstar.	*	
15.	Ability to use authoring systems to create appropriate lessons.		*
16.	Ability to use the computer to input data on student responses.		*
17.	Awareness of various computer related prosthetic devices, i.e., communication, wheelchairs.	*	*
18.	Awareness of the possible future uses of technology with individuals with severe handicapping conditions, i.e., robots, artificial intelligence.		*

*sig. at $\leq$ .05

Table 12
Group 1 Students' Pre and Post Means for Competency Items, t-Values, df, and Probability Levels

Items	Mean Pretest	Mean Posttest	t-Value	df	Probability
1. Understand the role that the computer has in Special Education.	3.22	2.48	3.51	22	.002*
2. Know the major types of application of computers to Special Education, i.e., CAI, CMI, Simulation, etc.	3.30	2.26	6.07	22	.000*
3. Know related resources and how to obtain access to them.	3.26	2.74	3.17	22	.004*
4. Be familiar with a variety of computers and peripherals appropriate for exceptional individuals.	3.22	2.52	4.06	22	.001*
5. Know the current and potential impact of computers on society, education, and special education.	2.70	2.48	1.31	22	.203
6. Knowledge of computer-assisted prosthetic devices for handicapped learners.	3.61	2.65	6.50	22	.000*
7. Know related technologies such as videodisc, various video displays, robotics, etc.	3.43	3.35	0.70	22	.492
8. Know the roles of computers in work and careers and be able to prepare handicapped students for the possible vocational uses of computers.	3.48	3.09	2.24	22	.036*
9. Be able to use special net, an electronic bulletin board and electronic mail service available via telecommunications.	3.65	3.22	3.54	22	.002*
10. Ability to conceive of future innovations in computer related technology.	3.22	2.91	2.30	22	.031*
11. Ability to consult with other school personnel, i.e. administrators, school nurse, etc., on the possible use of computers with handicapped learners.	2.91	2.61	2.61	22	.016*
12. Awareness of modified input devices for individual student's needs, i.e., micro-switches, touch screens, voice recognition, special keyboards.	3.39	2.65	4.38	22	.000*
13. Awareness of modified output devices for individual student's needs, i.e., large type screen, voice synthesis.	3.35	2.52	5.09	22	.000*
14. Ability to use computer managed instruction to monitor instructional process i.e., Aimstar.	3.65	3.22	2.65	22	.015*
15. Ability to use authoring systems to create appropriate lessons.	3.48	3.22	1.06	22	.299
16. Ability to use the computer to input data on student responses.	3.00	2.83	0.65	22	.505
17. Awareness of various computer related prosthetic devices, i.e., communication, wheelchairs.	3.35	2.78	2.51	22	.020*
18. Awareness of the possible future uses of technology with individuals with severe handicapping conditions, i.e., robots, artificial intelligence.	3.22	2.87	1.50	22	.148

*sig. at $\leq$ .05

Note. The lower the mean score, the higher the competency rating.

Table 13

Group 2 Students' Pre and Post Means for Competency Items, t Values, Df, and Probability Levels

	Items	Mean Pretest	Mean Posttest	t-Value	df	Probability
1.	Understand the role that the computer has in Special Education.	2.63	1.75	3.29	6	.017*
2.	Know the major types of application of computers to Special Education, i.e., CAI, CMI, Simulation, etc.	2.88	1.50	4.38	6	.005*
3.	Know related resources and how to obtain access to them.	3.13	2.25	3.29	6	.017*
4.	Be familiar with a variety of computers and peripherals appropriate for exceptional individuals.	3.00	2.25	1.44	6	.200
5.	Know the current and potential impact of computers on society, education, and special education.	2.63	1.88	1.99	6	.094
6.	Knowledge of computer-assisted prosthetic devices for handicapped learners.	3.63	2.38	4.38	6	.005*
7.	Know related technologies such as videodisc, various video displays, robotics, etc.	3.38	2.50	3.24	6	.018*
8.	Know the roles of computers in work and careers and be able to prepare handicapped students for the possible vocational uses of computers.	3.38	2.25	4.38	6	.005*
9.	Be able to use special net, an electronic bulletin board and electronic mail service available via telecommunications.	3.63	2.75	2.65	6	.038*
10.	Ability to conceive of future innovations in computer related technology.	3.00	2.25	2.00	6	.102
11.	Ability to consult with other school personnel, i.e. administrators, school nurse, etc., on the possible use of computers with handicapped learners.	2.75	2.13	2.50	6	.047*
12.	Awareness of modified input devices for individual student's needs, i.e., micro-switches, touch screens, voice recognition, special keyboards.	2.88	2.00	2.52	6	.045*
13.	Awareness of modified output devices for individual student's needs, i.e., large type screen, voice synthesis.	2.88	2.13	2.52	6	.045*
14.	Ability to use computer managed instruction to monitor instructional process i.e., Aimstar.	3.38	2.50	2.05	6	.086
15.	Ability to use authoring systems to create appropriate lessons.	3.75	2.63	3.58	6	.012*
16.	Ability to use the computer to input data on student responses.	2.88	1.88	8.00	6	.000*
17.	Awareness of various computer related prosthetic devices, i.e., communication, wheelchairs.	3.25	2.13	4.50	6	.004*
18.	Awareness of the possible future uses of technology with individuals with severe handicapping conditions, i.e., robots, artificial intelligence.	3.25	2.38	8.00	6	.000*

*sig. at $\leq$ .05

Note. The lower the mean score, the higher the competency rating.

Table 14

Group 1 and Group 2 Pretest Means for Competency Items, t Values, Df, and Probability Levels

	Items	Group 1	Group 2	t-Value	df	Probability
1.	Understand the role that the computer has in Special Education.	3.22	2.63	1.67	29	.107
2.	Know the major types of application of computers to Special Education, i.e., CAI, CMI, Simulation, etc.	3.30	2.88	1.16	29	.257
3.	Know related resources and how to obtain access to them.	3.27	3.13	.50	29	.618
4.	Be familiar with a variety of computers and peripherals appropriate for exceptional individuals.	3.22	3.00	.61	29	.547
5.	Know the current and potential impact of computers on society, education, and special education.	2.69	2.62	.20	29	.840
6.	Knowledge of computer-assisted prosthetic devices for handicapped learners.	3.61	3.63	- .07	29	.945
7.	Know related technologies such as videodisc, various video displays, robotics, etc.	3.43	3.38	.19	29	.853
8.	Know the roles of computers in work and careers and be able to prepare handicapped students for the possible vocational uses of computers.	3.48	3.38	.40	29	.694
9.	Be able to use special net, an electronic bulletin board and electronic mail service available via telecommunications.	3.65	3.63	.09	29	.932
10.	Ability to conceive of future innovations in computer related technology.	3.22	3.00	.57	28	.574
11.	Ability to consult with other school personnel, i.e. administrators, school nurse, etc., on the possible use of computers with handicapped learners.	2.91	2.75	.49	29	.630
12.	Awareness of modified input devices for individual student's needs, i.e., micro-switches, touch screens, voice recognition, special keyboards.	3.39	2.88	1.68	29	.105
13.	Awareness of modified output devices for individual student's needs, i.e., large type screen, voice synthesis.	3.35	2.88	1.46	29	.155
14.	Ability to use computer managed instruction to monitor instructional process i.e., Aimstar.	3.65	3.38	1.07	29	.323
15.	Ability to use authoring systems to create appropriate lessons.	3.48	3.75	- .71	29	.484
16.	Ability to use the computer to input data on student responses.	3.00	2.88	.30	29	.700
17.	Awareness of various computer related prosthetic devices, i.e., communication, wheelchairs.	3.35	3.25	.25	29	.806
18.	Awareness of the possible future uses of technology with individuals with severe handicapping conditions, i.e., robots, artificial intelligence.	3.22	3.25	- .08	29	.935

Note. The lower the mean score, the higher the competency rating.

Table 15

Group 1 and Group 2 Students' Gain Scores Means for Competency Items, Gain Scores, t Values, Df, and Probability Levels

	Items	Group 1	Group 2	t-Value	df	Probability
1.	Understand the role that the computer has in Special Education.	-0.74	-0.86	.29	28	.776
2.	Know the major types of application of computers to Special Education, i.e., CAI, CMI, Simulation, etc.	-1.04	-1.14	.29	28	.775
3.	Know related resources and how to obtain access to them.	-0.52	-.086	1.01	28	.332
4.	Be familiar with a variety of computers and peripherals appropriate for exceptional individuals.	-0.70	-0.43	-.76	28	.454
5.	Know the current and potential impact of computers on society, education, and special education.	-0.17	-0.71	1.53	28	.137
6.	Knowledge of computer-assisted prosthetic devices for handicapped learners.	-0.96	-1.14	.61	28	.544
7.	Know related technologies such as videodisc, various video displays, robotics, etc.	-0.09	-1.00	3.25	28	.003*
8.	Know the roles of computers in work and careers and be able to prepare handicapped students for the possible vocational uses of computers.	-0.35	-1.14	2.43	28	.022*
9.	Be able to use special net, an electronic bulletin board and electronic mail service available via telecommunications.	-0.39	-1.00	2.03	28	.052
10.	Ability to conceive of future innovations in computer related technology.	-0.26	-0.67	1.24	27	.226
11.	Ability to consult with other school personnel, i.e. administrators, school nurse, etc., on the possible use of computers with handicapped learners.	-0.39	-0.71	1.20	28	.241
12.	Awareness of modified input devices for individual student's needs, i.e., micro-switches, touch screens, voice recognition, special keyboards.	-0.78	-0.86	.22	28	.825
13.	Awareness of modified output devices for individual student's needs, i.e., large type screen, voice synthesis.	-0.78	-0.86	.20	28	.843
14.	Ability to use computer managed instruction to monitor instructional process i.e., Aimstar.	-0.43	-1.00	1.42	28	.165
15.	Ability to use authoring systems to create appropriate lessons.	-0.45	-1.29	2.42	27	.022*
16.	Ability to use the computer to input data on student responses.	-0.50	-1.14	1.90	27	.068
17.	Awareness of various computer related prosthetic devices, i.e., communication, wheelchairs.	-0.73	-1.29	1.68	27	.104
18.	Awareness of the possible future uses of technology with individuals with severe handicapping conditions, i.e., robots, artificial intelligence.	-0.45	-1.14	2.57	27	.016*

*sig. at $\leq$ .05

Note. The negative sign indicates an increase in competency rating. The higher the numeral the greater the increase.

There was only one area in which significant growth in competency level was not recorded and that was knowing the current and potential impact of computers on society, education and special education. This competency warrants further examination in order for course instructors to enhance student knowledge in this area. Through the use of hypothetical situations and simulated classroom experiences these skills could be strengthened. Furthermore, in order to examine whether the feedback of research results from Project INTERFACE TO C.W. Post professors impacted synergistically on student competencies, competency gain scores for Groups I and II were compared. As presented in Table 15, the competency pretest scores did not differ significantly between the groups, therefore, t-tests using gain scores were deemed appropriate. As presented in Table 16, Group II made greater gains than Group I in almost all of the competency areas with significance noted in four areas, namely: knowledge of related technologies such as video disc, various video displays, robotics, etc.; knowledge of the roles of comput[illegible] in work and career; ability to use authoring systems to create appr[illegible]te lessons; and awareness of the possible future uses of technology with individuals with severe handicapping conditions. Therefore, it appears that with greater input of research findings into college level course work, student competencies can be enhanced.

Results of Analyses of Student Attitude Measures

In order to determine changes in attitudes toward microcomputer implementation practices of teachers and administrators enrolled in a graduate level microcomputer education course, a questionnaire was constructed by Project INTERFACE staff. Thirty-six attitudinal items focused on the following areas: organizational and administrative factors, computer technology, PL 94-142 and IEPs, and general attitudes toward computers. In addition, the following microcomputer categories were rated through the use of ten semantic differential pairs:

1) classroom applications of computer technology
2) regular classroom application of computer technology
3) special education classroom applications of computer technology
4) applications of computer technology for school administrative management
5) applications of computer technology for IEPs
6) staff development in the use of computer technology of special education
7) hardware for computers in special education
8) software for computers in special education
9) staff involvement in the decision-making process of implementing microcomputer education in school settings

(See Appendix K for Attitude Questionnaire.)

This attitude rating scale was then distributed at the beginning and end of the summer, 1985, Fall, 1985, and Spring, 1986 semesters to those aforementioned students enrolled in the course entitled, Utilizing the Microcomputer in Special Education. As with the competency data, attitude data was collected from these three groups of students (Group I enrolled

in the summer of 1985; Group II enrolled in the fall of 1985; and Group III enrolled in the spring of 1986).

T-test analyses were performed on the attitude rating pre-post data for each of these three groups. Results of these analyses are reported below.

As presented in Tables 16-33, regarding all of the attitudinal items for the most part, no significant changes in attitudes toward organizational and administrative factors, computer technology, PL 94-142 and IEPs and attitudes toward computers in general as well as in the ten semantic differential areas were reported for each of the three groups. It appears that it probably takes more than one semester to change the attitudes of teacher and administrator trainees toward microcomputer implementation practices.

Table 16

Group 1 Opinions Re: Organizational and Administrative Factors, Pre and Posttest Means, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Impact of organizational climate on microcomputer technology implementation	2.43	2.09	1.45	22	.162
2. Need for knowledgeability of school building administrator in implementation of microcomputer technology	2.22	2.06	- .19	22	.852
3. Need for knowledgeability of school building administrator in assisting teachers in implementation of microcomputer technology	2.04	2.22	-1.00	22	.328

Note. Lower mean scores indicate more positive responses than higher mean scores.

Table 17

Group 2 Opionions Re: Organizational and Administrative Factors, Pre and Posttest Means, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Impact of organizational climate on microcomputer technology implementation	2.13	2.50	-2.05	7	.080
2. Need for knowledgeability of school building administrator in implementation of microcomputer technology	2.00	2.56	-1.25	8	.247
3. Need for knowledgeability of school building administrator in assisting teachers in implementation of microcomputer technology	2.00	2.44	- .77	8	.466

Note. Lower mean scores indicate more positive responses than higher mean scores.

Table 18

Group 3 Opinions Re: Organizational and Administrative Factors, Pre and Posttest Means, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Impact of organizational climate on microcomputer technology implementation	3.38	2.67	- .97	20	.343
2. Need for knowledgeability of school building administrator in implementation of microcomputer technology	2.95	2.68	1.00	21	.329
3. Need for knowledgeability of school building administrator in assisting teachers in implementation of microcomputer technology	2.55	2.41	.62	21	.544

Note. Lower mean scores indicate more positive responses than higher mean scores.

Table 19

Group 1 Opinons Re: Computer Technology, Pre and Posttests, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Simplicity of classroom planning	2.74	2.22	2.23	22	.036*
2. Time for classroom planning	3.22	3.13	.32	22	.753
3. Effect on children's learning	1.65	1.78	- .53	22	.601
4. Effect on teacher's role	2.27	2.14	.65	21	.525
5. Effect on development of IEP's	2.16	2.00	.64	18	.527
6. Need for emphasis in university training	1.61	1.52	.44	22	.665

*sig. $\leq$ .05

Note. Lower mean scores indicate more positive opinions than higher mean scores.

Table 20

Group 2 Opinions Re: Computer Technology, Pre and Posttests, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Simplicity of classroom planning	3.75	3.38	.55	7	.598
2. Time for classroom planning	3.13	3.25	- .28	7	.785
3. Effect on children's learning	1.75	1.63	1.00	7	.351
4. Effect on teacher's role	2.00	2.22	- .69	8	.512
5. Effect on development of IEP's	2.22	1.89	2.00	8	.081
6. Need for emphasis in university training	1.78	1.67	.36	8	.729

Note. Lower means scores indicate more positive opinions than higher mean scores.

Table 21

Group 3 Opinions Re: Computer Technology, Pre and Posttests, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Simplicity of classroom planning	2.86	2.55	1.19	21	.246
2. Time for classroom planning	3.09	3.09	.00	21	1.000
3. Effect on children's learning	1.96	2.04	- .32	22	.753
4. Effect on teacher's role	1.78	2.13	-1.36	22	.188
5. Effect on development of IEP's	2.60	2.25	1.07	19	.297
6. Need for emphasis in university training	2.48	1.96	2.64	22	.015*

* sig. $\leq$ .05

Note. Lower mean scores indicate more positive opinions than higher mean scores.

Table 22

Group 1 Opinions Re: P.L. 94-142 and IEP s, Pre and Posttests, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Knowledgeable about the Handicapped Law	3.13	3.00	.57	22	.575
2. Expectations for student learning	2.82	2.65	1.00	16	.332
3. Extent to which IEP's can be implemented in the classroom with present resources	3.11	3.00	.52	17	.607
4. Ease of designing IEP's	3.26	3.00	1.10	18	.287
5. Effect on teacher's role	2.83	2.50	2.38	17	.029*
6. Effect on children's learning	2.89	2.32	4.16	18	.001*

*sig. $\leq$ .05

Note. Lower mean scores indicate more positive opinions than higher mean scores.

Table 23

Group 2 Opinions Re: P.L. 94-142 and IEPs, Pre and Posttests, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Knowledgeable about the Handicapped Law	2.88	2.63	.55	7	.598
2. Expectations for student learning	2.89	2.75	.42	7	.685
3. Extent to which IEP's can be implemented in the classroom with present resources	2.75	2.88	-.42	7	.685
4. Ease of designing IEP's	2.25	2.25	.00	7	1.000
5. Effect on teacher's role	2.67	2.33	.82	8	.438
6. Effect on children's learning	2.33	2.33	.00	8	1.000

Note. Lower mean scores indicate more positive opinion than higher means scores.

Table 24

Group 3 Opinions Re: P.L. 94-142 and IEPs, Pre and Posttests, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Knowledgeable about the Handicapped Law	3.08	3.25	- .61	23	.548
2. Expectations for student learning	2.59	2.94	-1.24	16	.231
3. Extent to which IEP's can be implemented in the classroom with present resources	2.75	3.35	-2.04	19	.055
4. Ease of designing IEP's	3.11	3.11	.00	17	1.000
5. Effect on teacher's role	2.72	2.89	- .82	17	.421
6. Effect on children's learning	2.30	2.65	-1.44	19	.167

Note. Lower mean scores indicate more positive opinions than higher mean scores.

Table 25

Group 1 Attitudes Toward Computers, Pre and Posttest Means, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	DF	Probability
1. Computers dehumanize society by treating everyone as a number.	3.91	3.96	- .33	22	.747
2. A person today cannot escape the influence of computers.	1.48	1.61	- .72	22	.479
3. Computers make mistakes at least 10% of the time.	3.78	3.61	.94	22	.357
4. Computers will replace low-skilljobs and create jobs needing specialized training.	2.83	2.30	1.74	22	.097
5. Computers will improve health care.	2.00	1.70	2.08	22	.050*
6. Computers will improve law enforcement.	1.91	1.70	1.42	22	.171
7. Computers will improve education.	1.83	1.61	1.55	22	.135
8. If there was a computer in my classroom it would help me to be a better teacher.	2.87	2.22	2.40	22	.025*
9. Someday I will have a computer in my home.	1.26	1.39	-1.37	22	.186
10. A computer may someday take my job.	4.65	4.83	-1.16	22	.257
11. Computers can teach mathematics.	3.35	3.13	.82	22	.423
12. Computers can teach reading.	3.43	3.17	.95	22	.354
13. Computers are beyond the understanding of the typical person.	4.48	4.30	.89	22	.383
14. Computers are a tool much like a hammer or lathe.	1.61	1.78	-1.16	22	.257
15. Computers will create as many jobs as they eliminate.	2.48	2.00	3.14	22	.005*
16. Computers could enhance remedial instruction.	1.30	1.35	- .33	22	.747
17. Computers could relieve teachers of routine duties.	1.52	1.57	- .30	22	.770
18. Computers would take over parts of courses in my subject area.	2.59	2.41	.70	21	.492
19. Computers can be used successfully with courses which demand creative activities.	1.91	1.95	- .25	21	.803
20. I have become familiar with computers through previous experience.	1.90	2.05	- .72	20	.480
21. Organizational climate of my school is conducive to technological innovations.	2.55	2.64	- .30	21	.771

*sig. $\leq$ .05

Note. Lower mean scores indicate greater agreement than higher mean scores

Table 26

Group 2 Attitudes Toward Computers, Pre and Posttest Means, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Computers dehumanize society by treating everyone as a number.	4.67	4.33	1.41	8	.195
2. A person today cannot escape the influence of computers.	1.56	1.44	1.00	8	.347
3. Computers make mistakes at least 10% of the time.	3.22	3.44	- .61	8	.559
4. Computers will replace low-skill jobs and create jobs needing specialized training.	3.33	3.33	.00	8	1.000
5. Computers will improve health care.	2.78	2.44	.71	8	.500
6. Computers will improve law enforcement.	2.44	2.11	1.41	8	.195
7. Computers will improve education.	1.89	1.89	.00	8	1.000
8. If there was a computer in my classroom it would help me to be a better teacher.	2.22	2.22	.00	8	1.000
9. Someday I will have a computer in my home.	1.78	1.78	.00	8	1.000
10. A computer may someday take my job.	4.67	4.33	1.00	8	.347
11. Computers can teach mathematics.	3.00	3.44	- .59	8	.569
12. Computers can teach reading.	3.00	3.89	1.45	8	.184
13. Computers are beyond the understanding of the typical person.	4.44	4.44	.00	8	1.000
14. Computers are a tool much like a hammer or lathe.	2.00	1.38	1.67	7	.140
15. Computers will create as many jobs as they eliminate.	2.89	2.11	1.79	8	.111
16. Computers could enhance remedial instruction.	2.00	2.22	- .55	8	.594
17. Computers could relieve teachers of routine duties.	2.56	2.22	.43	8	.681
18. Computers would take over parts of courses in my subject area.	3.33	3.00	.60	8	.563
19. Computers can be used successfully with courses which demand creative activities.	2.11	3.00	-1.74	8	.121
20. I have become familiar with computers through previous experience.	2.50	2.50	.00	7	1.000
21. Organizational climate of my school is conducive to technological innovations.	2.13	1.75	.89	7	.402

Note. Lower mean scores indicate greater agreement than higher mean scores.

Table 27

Group 3 Attitudes Toward Computers, Pre and Posttest Means, t-Values, Df, and Probability Levels

Item	Pretest	Posttest	t-Value	Df	Probability
1. Computers dehumanize society by treating everyone as a number.	4.18	4.23	- .27	21	.789
2. A person today cannot escape the influence of computers.	1.41	1.41	.00	21	1.000
3. Computers make mistakes at least 10% of the time.	3.59	4.05	-2.11	21	.047*
4. Computers will replace low-skilljobs and create jobs needing specialized training.	2.85	2.55	1.14	19	.267
5. Computers will improve health care.	2.38	2.00	2.02	20	.057
6. Computers will improve law enforcement.	2.11	1.89	.89	18	.385
7. Computers will improve education.	1.76	1.86	- .62	20	.540
8. If there was a computer in my classroom it would help me to be a better teacher.	2.50	2.55	- .18	19	.858
9. Someday I will have a computer in my home.	1.19	1.14	.57	20	.576
10. A computer may someday take my job.	4.52	4.71	- .94	20	.358
11. Computers can teach mathematics.	1.24	1.29	- .46	18	.650
12. Computers can teach reading.	3.17	3.06	.49	17	.631
13. Computers are beyond the understanding of the typical person.	4.19	4.71	-2.45	20	.024*
14. Computers are a tool much like a hammer or lathe.	1.89	1.89	.00	18	1.000
15. Computers will create as many jobs as they eliminate.	2.43	2.90	-2.12	20	.047*
16. Computers could enhance remedial instruction.	1.62	1.67	- .33	20	.748
17. Computers could relieve teachers of routine duties.	1.76	1.76	.00	20	1.000
18. Computers would take over parts of courses in my subject area.	2.76	3.10	-1.67	20	.110
19. Computers can be used successfully with courses which demand creative activities.	2.05	1.77	1.55	21	.137
20. I have become familiar with computers through previous experience.	1.95	1.73	1.31	21	.204
21. Organizational climate of my school is conducive to technological innovations.	2.36	2.23	.65	21	.525

*sig. ≤ .05

Note. Lower mean scores indicate greater agreement than higher mean scores.

Table 28

Group 1 Pretest and Posttest Means for Semantic Differential Items, t-Values, Df, and Probability Levels

Item	Pretest Mean	Posttest Mean	t-Value	Df	Probability
1. Classroom application of computer technology	22.68	22.77	- .09	21	.926
2. Regular classroom application of computer technology	23.52	23.43	.09	22	.929
3. Special education application of computer technology	22.39	21.91	.53	22	.603
4. Application of computer technology for school administration management	24.09	23.35	.76	22	.455
5. Application of computer technology for IEPs	23.95	23.74	.22	18	.830
6. Staff development in the use of computer technology in special education	23.86	23.82	.05	21	.964
7. Hardware for computers in special education	23.48	22.30	1.05	22	.305
8. Software for computers in special education	23.09	20.55	3.54	21	.002*
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	24.95	24.32	.55	21	.585

*Sig. $\leq$ .05

Note. Lower mean scores indicate a more positive attitude than higher mean scores.

Table 29

Group 2 Pretest and Posttest Means for Semantic Differential Items, t-Values, Df, and Probability Levels

Item	Pretest Mean	Posttest Mean	t-Value	Df	Probability
1. Classroom application of computer technology	23.33	23.44	- .13	8	.900
2. Regular classroom application of computer technology	23.33	23.33	.00	8	1.000
3. Special education application of computer technology	22.33	22.67	- .32	8	.754
4. Application of computer technology for school administration management	23.67	22.78	.57	8	.586
5. Application of computer technology for IEPs	24.11	24.00	.08	8	.937
6. Staff development in the use of computer technology in special education	23.44	23.78	- .34	8	.744
7. Hardware for computers in special education	24.63	23.38	.84	7	.428
8. Software for computers in special education	23.25	22.88	.38	7	.718
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	24.75	24.13	.68	7	.521

Note. Lower mean scores indicate a more positive attitude than higher mean scores.

Table 30

Group 3 Pretest and Posttest Means for Semantic Differential Items, t-Values, Df, and Probability Levels

Item	Pretest Mean	Posttest Mean	t-Value	Df	Probability
1. Classroom application of computer technology	23.35	22.25	1.03	19	.316
2. Regular classroom application of computer technology	24.28	24.22	.05	17	.958
3. Special education application of computer technology	24.53	21.29	2.04	16	.058
4. Application of computer technology for school administration management	22.32	20.90	1.42	18	.174
5. Application of computer technology for IEPs	25.57	23.14	1.19	13	.255
6. Staff development in the use of computer technology in special education	23.31	22.81	.29	15	.772
7. Hardware for computers in special education	23.94	23.69	.11	15	.912
8. Software for computers in special education	23.63	22.38	1.04	15	.316
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	24.24	23.06	.87	16	.398

Note. Lower mean scores indicate a more positive attitude than higher mean scores.

Table 31

Group 1 Pretest and Posttest Means for Overall Attitude Items, t-Values, Df, and Probability Levels

Item	Pretest Mean	Posttest Mean	t-Value	Df	Probability
1. Classroom application of computer technology	1.41	1.50	- .81	21	.427
2. Regular classroom application of computer technology	1.48	1.67	-1.45	20	.162
3. Special education application of computer technology	1.48	1.39	.57	22	.575
4. Application of computer technology for school administration management	1.52	1.48	.30	22	.770
5. Application of computer technology for IEPs	1.74	1.89	-1.14	18	.268
6. Staff development in the use of computer technology in special education	1.81	1.62	1.28	20	.214
7. Hardware for computers in special education	1.65	1.43	1.23	22	.233
8. Software for computers in special education	1.55	1.45	.53	21	.605
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	1.91	1.82	.62	21	.540

Note. Lower mean scores indicate a more positive attitude than higher mean scores.

Table 32

Group 2 Pretest and Posttest Means for Overall Attitude Items, t-Values, Df, and Probability Levels

Item	Pretest Mean	Posttest Mean	t-Value	Df	Probability
1. Classroom application of computer technology	1.67	1.56	.55	8	.594
2. Regular classroom application of computer technology	1.67	2.00	-2.00	8	.081
3. Special education application of computer technology	1.56	1.44	1.00	8	.347
4. Application of computer technology for school administration management	1.89	1.78	.43	8	.681
5. Application of computer technology for IEPs	1.56	1.89	-1.15	8	.282
6. Staff development in the use of computer technology in special education	1.63	1.75	- .42	7	.685
7. Hardware for computers in special education	1.38	2.13	4.58	7	.003*
8. Software for computers in special education	1.75	1.88	-1.00	7	.351
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	1.75	1.50	.68	7	.516

*Sig. $\leq$ .05

Note. Lower mean scores indicate a more positive attitude than higher mean scores.

Table 33

Group 3 Pretest and Posttest Means for Overall Attitude Items, t-Values, Df, and Probability Levels

Item	Pretest Mean	Posttest Mean	t-Value	Df	Probability
1. Classroom application of computer technology	1.42	1.37	.20	18	.841
2. Regular classroom application of computer technology	1.60	1.53	.29	14	.774
3. Special education application of computer technology	1.44	1.33	.70	17	.495
4. Application of computer technology for school administration management	1.75	1.45	1.24	19	.230
5. Application of computer technology for IEPs	1.92	1.69	1.39	12	.190
6. Staff development in the use of computer technology in special education	1.63	2.06	-1.39	15	.186
7. Hardware for computers in special education	1.53	1.65	- .57	16	.579
8. Software for computers in special education	1.88	1.88	.00	16	1.000
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings					

Note. Lower mean scores indicate a more positive attitude than higher mean scores.

Furthermore, in order to examine whether the feedback of research results from Project INTERFACE to C.W. Post professors impacted synergistically on student attitudes, attitudinal mean gain scores for Groups I, II and III were compared. For the most part, attitudinal pretest scores did not differ significantly between the groups, therefore, t-tests using gain scores were deemed appropriate. (See Appendix L for Pre-test Comparisons Between the Groups.)

Moreover, as presented in Tables 34-50, for the most part, few significant gains between groups across semesters were found. It appears that teacher and administrator attitudes toward microcomputer practices do not seem to be affected within a semester's time, regardless of whether new information has been fed back into the graduate level course.

Table 34

Group 1 and Group 2 Opinions Re: Organizational and Administrative Factors, Mean Gain Scores, t-Values, Df, and Probability Levels

Item	Group 1	Group 2	t-Value	Df	Probability
1. Impact of organizational climate on microcomputer technology implementation	-.35	.38	-1.70	29	.100
2. Need for knowledgeability of school building administrator in implementation of microcomputer technology	.04	.56	-1.11	30	.275
3. Need for knowledgeability of school building administrator in assisting teachers in implementation of microcomputer technology	.17	.44	- .60	30	.553

NOTE: The negative sign indicates an increase in positive attitude. The greater the numeral, the greater the increase.

Table 35

Group 1 and Group 3 Opinions Re: Organizational and Administrative Factors, Mean Gain Scores, t-Values, Df, and Probability Factors

Item	Group 1	Group 3	t-Value	Df	Probability
1. Impact of organizational climate on microcomputer technology implementation	-.35	.29	-1.68	42	.100
2. Need for knowledgeability of school building administrator in implementation of microcomputer technology	.04	-.27	.89	43	.380
3. Need for knowledgeability of school building administrator in assisting teachers in implementation of microcomputer technology	.17	-.14	1.11	43	.274

Note. The negative sign indicates an increase in positive attitude. The greater the numeral, the greater the increase.

Table 36

Group 2 and Group 3 Opinions Re: Organizational and Administrative Factors, Mean Gain Scores, t- Values, Df, and Probability Levels

Item	Group 2	Group 3	t-Value	Df	Probability
1. Impact of organizational climate on microcomputer technology implementation	.38	.29	.18	27	.858
2. Need for knowledgeability of school building administrator in implementation of microcomputer technology	.56	-.27	1.67	29	.117
3. Need for knowledgeability of school building administrator in assisting teachers in implementation of microcomputer technology	.44	-.14	1.16	29	.257

Note. The negative sign indicates an increase in positive attitude. The greater the numeral, the greater the increase.

Table 37

Group 1 and Group 2 Opinions Re: Computer Technology, Mean Gain Scores, t-Values, Df, and Probability Levels

Item	Group 1	Group 2	t-Value	Df	Probability
1. Simplicity of classroom planning	-.52	-.38	-.26	29	.794
2. Time for classroom planning	-.09	.13	-.40	29	.693
3. Effect on children's learning	-.04	-.13	.17	29	.867
4. Effect on teacher's role	-.14	.22	-.92	29	.365
5. Effect on development of IEPs	-.16	-.33	.47	26	.645
6. Need for emphasis in university training	-.09	-.11	.07	30	.949

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 38

Group 1 and 3 Opinions Re: Computer Technology, Mean Gain Scores, t-Values, Df, and Probability Levels

Item	Group 1	Group 3	t-Value	Df	Probability
1. Simplicity of classroom planning	-.52	-.32	- .58	43	.568
2. Time for classroom planning	-.09	.00	- .25	43	.803
3. Effect on children's learning	-.04	.09	- .33	44	.739
4. Effect on teacher's role	-.14	.35	-1.45	43	.154
5. Effect on development of IEPs	-.16	-.35	.47	37	.643
6. Need for emphasis in university training	-.09	-.52	1.55	44	.127

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 39

Group 1 and Group 2 Opinions Re: P.L. 94-142 and IEPs, Mean Gain Scores, t-Values, Df, and Probability Levels

Item	Group 1	Group 2	t-Value	Df	Probability
1. Knowledgeable about the Handicapped Law	-.13	-.25	.25	29	.801
2. Expectations for student learning	-.18	-.13	- .16	23	.876
3. Extent to which IEPs can be implemented in the classroom with present resources	-.11	.13	- .63	24	.534
4. Ease of designing IEPs	-.26	.00	- .67	25	.509
5. Effect on teacher's role	-.33	-.33	.00	25	1.000
6. Effect on children's learning	-.58	.00	-2.48	26	.020*

*sig. ≤ .05

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 40

Group 1 and Group 3 Opinions Re: P.L. 94-142 and IEPs, Mean Gain Scores, t-Values, Df, and Probability Levels

Item	Group 1	Group 3	t-Value	Df	Probability
1. Knowledgeable about the Handicapped Law	-.13	.17	- .83	45	.412
2. Expectations for student learning	-.18	-.35	-1.58	32	.123
3. Extent to which IEPs can be implemented in the classroom with present resources	-.11	.60	-1.92	36	.062
4. Ease of designing IEPs	-.26	.00	- .53	35	.599
5. Effect on teacher's role	-.33	.17	-2.03	34	.050*
6. Effect on children's learning	-.58	.35	-3.27	32	.002*

*sig. $\leq$ .05

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 41

Group 2 and Group 3 Opinions Re: P.L. 94-142 and IEPs, Mean Gain Scores, t-Values, Df, and Probability Levels

Item	Group 2	Group 3	t-Value	Df	Probability
1. Knowledgeable about the Handicapped Law	-.25	.17	- .77	30	.448
2. Expectations for student learning	-.13	.35	-1.03	23	.312
3. Extent to which IEPs can be implemented in the classroom with present resources	.13	.60	- .94	26	.354
4. Ease of designing IEPs	.00	.00	.00	24	1.000
5. Effect on teacher's role	-.33	.17	-1.24	25	.228
6. Effect on children's learning	.00	.35	- .91	27	.369

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 42

Group 1 and Group 2 Students' Gain Score Means for Semantic Differential Items, t-Values, Df, and Probability Levels

Item	Group 1	Group 2	t-Value	Df	Probability
1. Classroom application of computer technology	.09	.11	- .01	29	.990
2. Regular classroom application of computer technology	- .09	.00	- .05	30	.958
3. Special education application of computer technology	- .48	.33	- .51	30	.614
4. Application of computer technology for school administration management	- .74	- .89	.08	30	.936
5. Application of computer technology for IEPs	- .21	- .11	- .06	26	.954
6. Staff development in the use of computer technology in special education	- .05	.33	- .22	29	.825
7. Hardware for computers in special education	-1.17	-1.25	.04	29	.971
8. Software for computers in special education	-2.55	- .38	-1.62	28	.117
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	1.23	.87	.14	28	.891

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 43

Group 1 and Group 3 Students' Gain Score Means for Semantic Differential Items, t-Values, Df, and Probability Levels

Item	Group 1	Group 3	t-Value	Df	Probability
1. Classroom application of computer technology	.09	-1.10	.83	40	.412
2. Regular classroom application of computer technology	- .09	- .06	- .02	39	.983
3. Special education application of computer technology	- .48	-3.24	1.60	38	.117
4. Application of computer technology for school administration management	- .74	-1.42	.48	40	.630
5. Application of computer technology for IEPs	- .21	-2.43	1.07	31	.293
6. Staff development in the use of computer technology in special education	- .05	- .50	.24	36	.808
7. Hardware for computers in special education	-1.17	- .25	- .40	37	.688
8. Software for computers in special education	-2.55	-1.25	- .98	36	.336
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	1.23	- .25	.69	36	.493

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 44

Group 2 and Group 3 Students' Gain Score Means for Semantic Differential Items, t-Values, Df, and Probability Levels

Item	Group 2	Group 3	t-Value	Df	Probability
1. Classroom application of computer technology	.11	-1.10	.71	27	.483
2. Regular classroom application of computer technology	.00	- .06	.04	25	.972
3. Special education application of computer technology	.33	-3.24	1.54	24	.137
4. Application of computer technology for school administration management	- .89	-1.42	.29	26	.771
5. Application of computer technology for IEPs	- .11	-2.43	.83	21	.414
6. Staff development in the use of computer technology in special education	.33	- .50	.35	23	.731
7. Hardware for computers in special education	-1.25	- .25	- .30	22	.768
8. Software for computers in special education	- .38	-1.25	.47	22	.642
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	.88	- .25	.50	22	.624

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 45

Group 1 and Group 2 Students' Gain Score Means for Overall Attitude Items, t-Values, Df, and Probability Levels

Item	Group 1	Group 2	t-Value	Df	Probability
1. Classroom application of computer technology	.09	- .11	.93	29	.359
2. Regular classroom application of computer technology	.19	.33	- .62	28	.538
3. Special education application of computer technology	- .09	- .11	.09	30	.925
4. Application of computer technology for school administration management	- .04	- .11	.24	30	.815
5. Application of computer technology for IEPs	.16	.33	- .62	26	.538
6. Staff development in the use of computer technology in special education	- .19	.13	-1.05	27	.303
7. Hardware for computers in special education	- .22	.75	-3.04	29	.005*
8. Software for computers in special education	- .09	.13	- .72	28	.476
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	- .09	- .25	.49	28	.628

*Sig. $\leq$ .05

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 46

Group 1 and Group 3 Students' Gain Score Means for Overall Items, t-Values, Df, and Probability Levels

Item	Group 1	Group 3	t-Value	Df	Probability
1. Classroom application of computer technology	.09	- .05	.53	39	.597
2. Regular classroom application of computer technology	.19	- .07	1.04	34	.305
3. Special education application of computer technology	- .09	- .11	.11	39	.914
4. Application of computer technology for school administration management	- .04	- .30	.93	41	.356
5. Application of computer technology for IEPs	.16	.23	1.80	30	.082
6. Staff development in the use of computer technology in special education	- .19	.43	-1.94	35	.060
7. Hardware for computers in special education	- .22	.12	-1.23	38	.227
8. Software for computers in special education	- .09	.00	- .32	37	.747
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	- .09	.11	- .72	38	.476

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 47

Group 2 and Group 3 Students' Gain Score Means for Overall Attitude Items, t-Values, Df, and Probability Levels

Item	Group 2	Group 3	t-Value	Df	Probability
1. Classroom application of computer technology	- .11	- .05	- .14	26	.886
2. Regular classroom application of computer technology	.33	- .07	1.24	22	.229
3. Special education application of computer technology	- .11	- .11	.00	25	1.000
4. Application of computer technology for school administration management	- .11	- .30	.47	27	.642
5. Application of computer technology for IEPs	.33	- .23	1.81	20	.085
6. Staff development in the use of computer technology in special education	.13	.44	- .63	22	.535
7. Hardware for computers in special education	.75	.12	1.94	23	.064
8. Software for computers in special education	.13	.00	.36	23	.720
9. Staff involvement in the decision-making process of implementing microcomputer education in school settings	- .25	.11	- .80	24	.433

Note. The negative sign indicates an increase in competency rating. The higher the numeral, the greater the increase.

Table 48

Group 1 and Group 2 Attitudes Toward Computers, Mean Gain Scores, t-Values Df, and Probability Levels

Item	Group 1	Group 2	t-Value	Df	Probability
1. Computers dehumanize society by treating everyone as a number.	.04	-.33	1.46	30	.155
2. A person today cannot escape the influence of computers.	.13	-.11	.80	30	.427
3. Computers make mistakes at least 10% of the time.	-.17	.22	-1.06	30	.295
4. Computers will replace low-skill jobs and create jobs needing specialized training.	-.52	.00	.90	30	.377
5. Computers will improve health care.	-.30	-.33	.08	30	.938
6. Computers will improve law enforcement.	-.22	-.33	.40	30	.688
7. Computers will improve education.	-.22	.00	- .81	30	.423
8. If there was a computer in my classroom it would help me to be a betier teacher.	-.65	.00	-1.30	30	.205
9. Someday I will have a computer in my home.	.13	.00	.71	30	.485
10. A computer may someday take my job.	.17	-.33	1.61	30	.118
11. Computers can teach mathematics.	-.22	.44	-1.06	30	.299
12. Computers can teach reading.	-.26	.88	-1.98	30	.057
13. Computers are beyond the understanding of the typical person.	-.17	.00	- .43	30	.668
14. Computers are a tool much like a hammer or lathe.	.17	.63	2.39	29	.023*
15. Computers will create as many jobs as they eliminate.	-.48	-.70	.83	30	.413
16. Computers could enhance remedial instruction.	.04	.22	- .55	30	.587
17. Computers could relieve teachers of routine duties.	.04	-.33	.71	30	.484
18. Computers would take over parts of courses in my subject area.	.87	.44	.83	30	.413
19. Computers can be used successfully with courses which demand creative activities.	.05	.89	-1.97	29	.058
20. I have become familiar with computers through previous experience.	.14	.00	.41	27	.682
21. Organizational climate of my school is conducive to technological innovations.	.09	-.38	.81	28	.422

* sig. $\leq$ .05

Note. The negative sign indicates an increase in competency ratings. The higher the numeral, the greater the increase.

Table 49

Group 1 and Group 3 Attitudes Toward Computers, Mean Gain Scores, t-Values, Df, and Probability Levels

Item	Group 1	Group 3	t Value	Df	Probability
1. Computers dehumanize society by treating everyone as a number.	.04	.05	- .01	43	.993
2. A person today cannot escape the influence of computers.	.13	.00	.58	43	.566
3. Computers make mistakes at least 10% of the time.	-.17	.45	-2.22	43	.032*
4. Computers will replace low-skill jobs and create jobs needing specialized training.	-.52	- .30	- .55	41	.587
5. Computers will improve health care.	-.30	- .38	.32	42	.748
6. Computers will improve law enforcement.	-.22	- .21	- .03	40	.980
7. Computers will improve education.	-.22	.10	-1.51	42	.138
8. If there was a computer in my classroom it would help me to be a better teacher.	-.65	.05	-1.81	41	.078
9. Someday I will have a computer in my home.	.13	- .05	1.39	42	.172
10. A computer may someday take my job.	.17	.19	- .07	42	.947
11. Computers can teach mathematics.	-.22	.11	- .90	40	.374
12. Computers can teach reading.	-.26	- .11	- .40	39	.689
13. Computers are beyond the understanding of the typical person.	-.17	.52	-2.41	42	.020*
14. Computers are a tool much like a hammer or lathe.	.17	.00	.63	40	.530
15. Computers will create as many jobs as they eliminate.	-.48	.48	-3.57	42	.001*
16. Computers could enhance remedial instruction.	.04	.05	- .02	42	.983
17. Computers could relieve teachers of routine duties.	.04	.00	.15	42	.885
18. Computers would take over parts of courses in my subject area.	.87	1.33	-1.10	42	.276
19. Computers can be used successfully with courses which demand creative activities.	.05	- .27	1.26	42	.214
20. I have become familiar with computers through previous experience.	.14	- .23	1.41	41	.167
21. Organizational climate of my school is conducive to technological innovations.	.09	- .14	.61	42	.546

* sig. $\leq$ .05

Note. The negative sign indicates an increase in positive attitude. The greater the numeral, the greater the increase.

Table 50

Group 2 and Group 3 Attitudes Towaard Computers, Mean Gain Scores, t-values, df, and Probability Levels

Item	Group 2	Group 3	t-Value	Df	Probability
1. Computers dehumanize society by treating everyone as a number.	-.33	.05	-1.25	29	.221
2. A person today cannot escape the influence of computers.	-.11	.00	- .51	29	.616
3. Computers make mistakes at least 10% of the time.	.22	.45	- .57	29	.575
4. Computers will replace low-skill jobs and create jobs needing specialized training.	.00	- .30	.57	27	.572
5. Computers will improve health care.	-.33	- .38	.11	28	.910
6. Computers will improve law enforcement.	-.33	- .21	- .32	26	.750
7. Computers will improve education.	.00	.10	- .34	28	.736
8. If there was a computer in my classroom it would help me to be a better teacher.	.00	.05	- .10	27	.920
9. Someday I will have a computer in my home.	.00	- .05	.28	28	.778
10. A computer may someday take my job.	-.33	.19	-1.38	28	.177
11. Computers can teach mathematics.	.44	.11	.56	26	.579
12. Computers can teach reading.	.89	- .11	1.88	25	.073
13. Computers are beyond the understanding of the typical person.	.00	.52	-1.24	28	.224
14. Computers are a tool much like a hammer or lathe.	-.63	.00	-1.40	25	.173
15. Computers will create as many jobs as they eliminate.	-.78	.48	-2.82	28	.009*
16. Computers could enhance remedial instruction.	.22	.05	.51	28	.613
17. Computers could relieve teachers of routine duties.	-.33	.00	- .51	28	.611
18. Computers would take over parts of courses in my subject area.	.44	1.33	-1.54	28	.135
19. Computers can be used successfully with courses which demand creative activities.	.88	- .27	2.74	29	.010*
20. I have become familiar with computers through previous experience.	.00	- .23	.73	28	.471
21. Organizational climate of my school is conducive to technological innovations.	-.38	- .14	- .55	28	.584

* sig. $\leq$ .05

Note. The negative sign indicates an increase in positive attitude. The greater the numeral, the greater the increase.

PHASE FIVE: DOCUMENTATION AND DISSEMINATION

Documentation of project activities was conducted through various data collection procedures including narrative logs, charts, open-ended questionnaires, interview schedules, checklists, and rating scales. The specific instruments which were utilized for documentation and data collection were as follows:

- Preliminary survey
- Field observation survey
- In-depth interview for administrators
- In-depth interview for teachers and other staff
- Competency checklist
- Computer background and attitude questionnaire
- Narrative feedback chart
- Formative evaluation log
- Software inventory chart

A number of innovations were adapted at the demonstration site as a result of the technical assistance which was provided by Project INTERFACE staff. These innovations, products of the project, were as follows:

- A section entitled, "Computer Corner" became a regular feature of the principal's weekly newsletter to teachers
- A teacher committee which was created to evaluate software met four times within one year
- The school staff produced a written philosophy of the use of computer technology in education
- Long-range goals for the use of computer technology in K-6 Skills Centers were developed

- Short-term objectives for the use of computer technology in K-6 Skills Centers were developed
- A written job description for the role of an elementary computer resource teacher was developed
- A computer implementation needs assessment was conducted for the building
- Written rules for use of computers were developed and posted in classrooms
- A printed hardware inventory was developed
- A printed software inventory was developed
- A computer software sign-out sheet was put into use for teachers

Dissemination activities included visitations to district personnel and participation in professional conferences. During the year that technical assistance was provided at the demonstration site, Project INTERFACE staff conducted seven meetings with district administrators, three meetings with teachers, and four meetings with student teachers.

Project staff participated in local, regional, and national conferences using these as opportunities to provide information and to promote discussion in regard to project activities. The locations and dates of these conferences were:

- Young Adult Institute, New York, New York - 4/24-4/25/85
- Special Education Technology Information Exchange, Washington, D.C. 6/2-6/4/85
- Northeastern Educational Research Association, Granit Hotel, N.Y. 10/23-10/24/85
- Closing the Gap, Minneapolis, MN 10/30-11/2/85
- Long Island University, C.W. Post Campus Research Forum, Greenvale, New York 11/22/85

°Council for Exceptional Children, New Orleans, LA, 3/31-4/4/86

°Special Education Technology Information Exchange, Washington, DC, 6/86

Nassau BOCES has provided information about Project INTERFACE to the New York State Education Department and, through the New York State network, to the other regional BOCES in New York State.

The final project report may be used as a model for implementation of microcomputer technology into programs for the handicapped.

SUMMARY AND CONCLUSIONS

The overall project consisted of five phases of activities. These were: 1) determination by experts in the field of most effective microcomputer practices, 2) assessment of implementation of effective microcomputer practices in school sites, 3) development of a demonstration site, 4) development, implementation, and evaluation of a college/local school district/intermediary educational agency collaborative model for preservice and in-service training, and 5) documentation and dissemination of materials pertaining to the implementation of microcomputer technology.

A rating scale was developed based upon intensive review of the literature coupled with exploratory site visits at three local suburban districts. Analysis of this instrument, which was administered to 53 experts in microcomputer education and special education, identified specific issues and considerations which were considered important, by more than 70% of the experts for effective implementation of microcomputers in special education. These important issues and considerations included:

- °A formal needs assessment coupled with long- and short-range goals and a written philosophy/policy statement;
- °Specific budgetary allocations with incremental increases;
- °Systematic evaluation of all aspects of the microcomputer program, including both formative and summative evaluation components;
- °A districtwide coordinator position for microcomputer/special education with a written job description;
- °Definite maintenance contracts and policies;
- °Consistent information dissemination;

°Written classroom management rules need to be posted in all of the special education microcomputer rooms;

°A districtwide committee for the review of hardware;

°A written hardware inventory to be located in the central office and, also, in each building;

°Stated written criteria and guidelines for the acquisition of hardware;

°Separate computers used for instructional and for administrative functions;

°A committee to review and select software, and to establish guidelines for software acquisition;

°A written software inventory and an appropriate cataloging and storage system/library located in the central office;

°Computer literacy incentives for teachers in the form of college and/or step credit and released time;

°In-service training,

°Networking with other districts or regional education agencies; and

°Developing contractual agreements with outside sources.

A needs assessment analyzed the extent to which issues and considerations identified by experts as important to effective implementation of microcomputers in special education were already in place at six school sites. Improvements in microcomputer implementation which appeared warranted were: all areas of administrative management, classroom management, hardware and software issues, instructional issues, and staff development.

A demonstration site was provided technical assistance to enhance its microcomputer implementation effort. Documentation and evaluation of technical assistance was maintained through a technical assistance log, observational visits, and a series of interviews with experts, administrators, and teachers at the site.

Approximately one-third of the implementation goals were targeted for the demonstration site within one school year. Progress within each of the selected goal areas was realized within the school year; and more than half of the targeted goals were fully completed within the school year. Goals in the administrative and classroom management areas were more fully realized within a year's time than were goals pertaining to hardware, software, instruction, and staff development issues. These latter issues required additional budgetary allocations, coupled with the development of committees, committee meetings, and a more lengthy decision-making process.

Project INTERFACE field-research results were integrated into microcomputer special education courses offered to teaching and administrative trainees at the C.W. Post Campus of Long Island University. Analysis of pre- and posttest data indicated that students rated themselves as significantly more competent in microcomputer practices after completion of the course as compared to their level of competence at the start of the course. There was, however, no difference in attitude ratings of the students in regard to microcomputer implementation practices after completion of the courses as compared to their attitude ratings at the start of the courses.

References

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